THE APPLICATION OF NEW PRODUCT DEVELOPMENT PRINCIPLES IN THE PHARMACEUTICAL INDUSTRY: A COMPARATIVE STUDY OF MARKETING PRACTITIONERS' PERCEPTIONS

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DECLARATION

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and that I have not previously in its entirely or in part submitted it at any university for a degree.

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Date: 2000/11/14

SUMMARY

New products are indispensable to the growth of the modern business enterprise. Increased global and local competition, better informed consumers, rapidly changing technology and the short life span of products are typical of the reasons why it is necessary to develop new products. Traditionally new product development took place in accordance with a rigid new product development process where a next phase was dependent on the completion of preceding phases. The increased pressure to produce new products in shorter time spans has led to the development and application of less streamlined and rigid processes for the development of new products.

The pharmaceutical industry has certain unique characteristics important for new product development. It spends more than five times than the average of all industries on research and development. New product development in the pharmaceutical industry largely depends on the discovery of new clinical entities and the development process is furthermore also highly regulated by governments. The focus of product evaluation in the pharmaceutical industry has also undergone a major shift. Traditionally the industry dealt with diseases which were defined broadly and as such the focus was on diseases and not individuals. The result was that consumer acceptance was virtually never evaluated. The shift is now to consumer acceptance because consumers become increasingly better informed and take part in decisions regarding their health and medical care. A further reason for the consumer focus lies in the genetic understanding of patients and this enable pharmaceutical companies to segment patients on the basis of pharmaco-genomic descriptions.

The objectives of the study are twofold. In the first instance, the study assesses whether marketing practitioners in the South African pharmaceutical industry agree with the fundamental principles of new product development which are identified in academic literature. The responses from marketing personnel were obtained and analysed to establish their beliefs regarding new product development. The fundamental principles of new product development which form the focus of this study, were those that Calantone, Di Benedetto and Haggblom (1995) used in their research. The second objective of the study is to compare the findings in respect of the South African pharmaceutical industry with those of the study undertaken by Calantone, Di Benedetto and Haggblom in 1995. The purpose of the study is to establish whether the new product development principles taught in marketing management courses are relevant for the pharmaceutical industry.

The method of investigation was divided into two sections, i.e. a literature overview and an empirical study. The literature study commenced with research on new product development in the South African Pharmaceutical Industry and other parts of the world.

The Calantone, Di Benedetto and Haggblom (1995) questionnaire was also used in this study for data collection. The 91 pharmaceutical companies listed in Volume 34 of the 1999 MIMS Desk formed the population of the study. After contacting these companies a more accurate list was set up. After taking into account all the mergers that took place, 65 companies eventually constituted the population. Twenty nine of the questionnaires sent were returned and could be used. This represents a response rate of 44.6%. The organisations involved were responsible for 69.4% of the annual turnover of the total pharmaceutical industry in 1998 and their responses could therefore be regarded as representative of the pharmaceutical industry of South Africa. The questionnaire attended to the following principles of new product development:

- Product innovation
- New product development and launch tasks
- Product diffusion
- Interface between marketing, research and development
- Organisational issues

The information collected in respect of each pharmaceutical company was the following:

- Annual turnover
- Number of products manufactured and marketed
- Number of employees
- Number of new products launched during the past five years

The findings of this study indicate that marketing staff in the South African pharmaceutical industry strongly agreed with those fundamental principles of new product development which were identified in academic literature. There was also a significant correlation between this study and the study undertaken by Calantone, Di Benedetto and Haggblom with respect to the percentage agreement on the various statements. It may thus be concluded that new product development principles taught in marketing managing courses are relevant for and are applied by marketing staff in the pharmaceutical industry in South Africa.

OPSOMMING

Nuwe produkte is onontbeerlik vir die groei van die moderne sake-onderneming. 'n Toename in globale en lokale mededinging, beter ingeligte verbruikers, snel veranderende tegnologie en die kort lewensduur van produkte is tipies van die redes waarom dit belangrik is om nuwe produkte te ontwikkel. Tradisioneel het nuweprodukontwikkeling volgens 'n rigiede nuweprodukontwikkelingsproses plaasgevind waar 'n volgende fase afhanklik was van die voltooiing van voorafgaande fases. Die verhoogde druk om nuwe produkte in korter tye te vervaardig het tot die ontwikkeling en toepassing van minder stroombelynde en rigiede prosesse vir die ontwikkeling van nuwe produkte gelei.

Die farmaseutiese bedryf het sekere unieke eienskappe wat belangrik is vir nuweprodukontwikkeling. Die farmaseutiese bedryf bestee meer as vyf keer die gemiddelde van alle bedrywe op navorsing en ontwikkeling. Nuweprodukontwikkeling in die farmaseutiese bedryf is grootliks afhanklik van die ontdekking van nuwe kliniese entiteite en die ontwikkelingsproses word verder ook intensief gereguleer deur regerings. Die fokus van produkbeoordeling in die farmaseutiese bedryf het ook 'n verskuiwing ondergaan. Tradisioneel het die bedryf gehandel met siektes wat breed omskryf is en die fokus as sulks was op siektes en nie op individue nie. Die gevolg was dat verbruikersaanvaarding feitlik nooit beoordeel was nie. Die verskuiwing is nou na verbruikersaanvaarding omdat verbruikers toenemend beter ingelig word en deelneem aan besluite wat hulle gesondheid en mediese sorg raak. 'n Verdere rede vir die verbruikerfokus is daarin geleë dat pasiënte nou geneties verstaan kan word en dit maak vir farmaseutiese maatskappye moontlik om pasiënte op 'n farmakologies-genomiese basis te segmenteer.

Die doelstellings van die studie is tweeledig. In die eerste instansie beoordeel die studie of bemarkingspersoneel werksaam in die die Suid-Afrikaaanse farmaseutiese bedryf, saamstem met die fundamentele beginsels ten opsigte van nuweprodukontwikkeling wat in die akademiese literatuur geïdentifiseer is. Die response van bemarkingpersoneel is verkry en ontleed om hulle oortuigings ten opsigte van nuweprodukontwikkeling vas te stel.

Die fundamentele beginsels van nuweprodukontwikkeling wat die fokus van hierdie studie vorm, is dié wat Calantone, Di Benedetto en Haggblom (1995) in hulle navorsing gebruik het. Die tweede doelstelling van die studie is om die bevindings ten opsigte van die Suid-Afrikaanse farmaseutiese bedryf te vergelyk met dié van die studie onderneem deur Calantone, Di Benedetto en Haggblom in 1995. Die doel van die studie is om vas te stel of die nuweprodukontwikkeling

beginsels wat in bemarkingsbestuurkursusse onderrig word, relevant is vir die farmaseutiese bedryf.

Die metode van ondersoek is onderverdeel in twee gedeeltes, naamlik 'n literatuuroorsig en 'n empiriese studie. Die literatuurstudie het begin met navorsing oor nuweprodukontwikkeling in die Suid-Afrikaanse farmaseutiese bedryf en ander wêrelddele.

Die Calantone, Di Benedetto en Haggblom (1995) vraelys is ook in hierdie studie vir die insameling van data gebruik. Die 91 farmaseutiese firmas wat in Volume 34 van die 1999 MIMS Desk gelys is, het die populasie van die studie gevorm. Na gesprekke met hierdie firmas en nadat alle samesmeltings in ag geneem is, is 'n meer akkurate lys opgestel en het die populasie uiteindelik uit 65 firmas bestaan. Nege en twintig van die vraelyste wat terugontvang is kon gebruik word. Hierdie verteenwoordig 'n responskoers van 44.6%. Die organisasies wat gereageer het was verantwoordelik vir 69.4% van die jaarlikse omset van die totale farmaseutiese bedryf in 1968 en die responses sou dus as verteenwoordigend van die farmaseutiese bedryf in Suid-Afrika beskou kon word. Die vraelys het aandag aan die volgende beginsels van nuweprodukontwikkeling gegee:

- Produk innovasie
- Nuweproduk ontwikkeling en loodstake
- Produkdiffusie
- Koppelvlakke tussen bemarking, navorsing en ontwikkeling
- Organisatoriese kwessies

Die inligting wat ten opsigte van elke farmaseutiese firma ingesamel is, is die volgende:

- Jaarlikse omset
- Aantal produkte vervaardig en bemark
- Aantal werknemers
- Aantal nuwe produkte wat gedurende die afgelope vyf jaar geloods is

Die bevindings van hierdie studie toon aan dat die bemarkingspersoneel in die Suid-Afrikaanse farmaseutiese bedryf sterk saamstem ten opsigte van die beginsels van nuweprodukontwikkeling wat in die akademiese literatuur geïdentifiseer is. Daar bestaan ook 'n betekenisvolle korrelasie tussen hierdie studie en die Calantone, Di Benedetto en Haggblom studie ten opsigte van die persentasie wat saamgestem word oor die verskillende stellings. Die gevolgtrekking kan dus gemaak word dat die nuweproduk beginsels wat in bemarkingskursusse aangebied word, relevant is vir en toegepas word deur bemarkingspersoneel in die farmaseutiese bedryf in Suid-Afrika.

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Table of Contents

List of Figures

List of Tables

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND TO THE STUDY

1.1.1 New product development

New product development – according to Kotler 1996 – is the development of original products, product improvements, product modifications, and new brands as a result of the firm's own research and development efforts. In Chapter two it will become clear that the term, "new product," means different things to different people.

1.1.2 Role of new product development in an organisation

The importance and role of the development of new products differ from one industry to another. Some companies' complete future depends on whether they produce new products and others could continue much as they have done in the past without developing anything new, and even such companies would in all likelihood remain active in future. Ultimately it all depends on the nature of business.

The pharmaceutical industry is unique in that it spends more than five times more (19.4% of sales) than all the industries' average (3.8%) on research and development (Ruijten, 1997). New product development is crucial to the continued existence of the pharmaceutical industry. In 1983 the top 20 pharmaceutical companies engaged approximately 894 projects in preclinical trials. Given a success rate of 40% for discovery compounds, only 358 drugs could be expected to pass from this stage to clinical development stage. Only 10% of those, i.e. 36 drugs, would ever reach the market. Since then the number of new drugs being developed have increased dramatically. These increased from 2853 in 1996 to 3102 in 1997 and it has shown a further increase to 3278 in March 1998. This is because of substantial technological development in the screening and evaluation of New Chemical Entities (NCE), such as genomics and mass spectrometry. It is said that the increase in New Chemical Entities' screening in part led to an increase in research and development expenditure (Pricewaterhouse Report, 1998).

An analysis of patent expiries and market pressures (Pricewaterhouse Report, 1998) reveals that the existing pipeline of drugs would generate an average of only 5.5 % annual earnings growth, which is less than half the 13% necessary to meet shareholders' expectations. This is termed the earnings gap. In order to increase earnings at the required rate, it is suggested that companies would need to pursue a combination of three key approaches:

- growing existing products
- pursuing additional new product strategies
- improving margins through cost reductions

Many pharmaceutical companies are turning to mergers and acquisitions to plug strategic holes and to accelerate operational improvements. Whether merging or not, they have at their disposal a wide array of measures to boost effectiveness and improve productivity. A concerted focus on near-term performance is required to navigate the industry through the challenge.

1.1.3 The new product development process

A number of different new product development processes, or so-called product creation processes, are known. One could differentiate between the conventional and the concurrent product development processes.

The conventional process is the most commonly used for the development of new products. It is termed, "conventional," because it follows a very structured and rigid process where the next step depends on the completion of the previous step in the process. Unconventional processes do not have the confined boundaries and stages of the conventional processes. For example some companies in Japan use a more holistic and concurrent process for new product development. Tackeuchi and Nonaka (1986) refer to this method of new product development as playing "rugby," where the project gets passed within the team as the ball would be in a rugby match, whilst all the players move as a unit on the field. This "rugby" approach has six characteristics: built-in instability, self-organising project teams, overlapping development phases, "multi-learning", subtle control and organisational transfer of learning. These characteristics form a fast and flexible new product development process, which operates in a much more effective manner than the traditional sequential process.

1.1.4 Factors which shorten the lifetime of products

We live in an ever-changing world where constant advances in medicine, biology, epidemiology, economics and information technology occur on a daily basis. In the health industry ever increasing numbers of diseases are discovered and new cures are consequently indicated.

Current sales projections of the global pharmaceutical industry suggest that the industry's turnover will show an increase of 7% per annum. In order to achieve this growth, a pharmaceutical company would need on average to generate US$ 28.9 billion in sales between 2000 and the year 2005. In order to attain this growth, a company would need to spend an average of US$ 1.9 billion a year on research and development by the year 2005. This should enable a company to produce between 22 and 31 drugs (this assumes the research and development costs per drug of US$ 500m and US$ 350m respectively at today's prices) over the next 7 years. This would put an enormous strain on any company's research and development operations. It is said that even if the top 20 companies should manage to produce sufficient effective new drugs, the sale of about 90% of all new drugs would earn less than US$ 180 million a year. Research indicates that, if the top 20 companies are to deliver a sales growth of 7% per annum in line with industry forecasts, they would need to dramatically improve their research and development productivity, or to ensure that every drug they produce is a billion-dollar blockbuster (Pricewaterhouse Report, 1998).

1.2 OBJECTIVES AND PURPOSE OF THE STUDY

The objectives of the study are twofold. In the first instance, the study assesses whether marketing practitioners in the South African pharmaceutical industry agree with the fundamental principles of new product development which are identified in academic literature. The responses from marketing personnel were obtained and analysed to establish their beliefs regarding new product development. The fundamental principles of new product development which form the focus of this study, were those that Calantone, Di Benedetto and Haggblom (1995) used in their research.

The second objective of the study is to compare the findings of the South African pharmaceutical industry with those of the study undertaken by Calantone, Di Benedetto and Haggblom in 1995.

The purpose of the study is to ensure that the new product development principles taught in marketing management courses are relevant for the pharmaceutical industry.

1.3 METHOD OF INVESTIGATION

The method of investigation was divided into two sections, i.e. a literature overview and an empirical study.

1.3.1 Literature study

The literature study commenced with research on new product development in the South African Pharmaceutical Industry. No published information on this type of development in the South African Pharmaceutical Industry as such could be found. The search subsequently focused on information regarding the South African Pharmaceutical Industry, and furthermore on new product development world wide. It was found that very little or no research on this topic has been done in the past and the results could, therefore, be valuable to both the pharmaceutical industry and the marketing education sector.

The following sources on new product development were consulted for this study:

- 15 books
- 104 articles
- 6 presentations
- Sets of lecture notes
- 1 case study
- Websites
- Law on Medicine

The articles, books and presentations used by Calantone, Di Benedetto and Haggblom (1995) to draft their questionnaire are included in the sources indicated above.

Important information was obtained on several aspects of new product development. Below is a list of some of these topics:

- Definitions and categories of new products
- Different new product development processes
- Why new product development is important

- Why new product development is different in the pharmaceutical industry
- Regulation of product development in the pharmaceutical industry
- Innovation and diffusion of innovation in the pharmaceutical industry
- The international pharmaceutical industry
- The South African pharmaceutical industry

1.3.2 The empirical study

The Calantone, Di Benedetto and Haggblom (1995) questionnaire was also used in this study for data collection. The 91 pharmaceutical companies listed in Volume 34 of the 1999 MIMS Desk formed the population of the study. After contacting these companies a more accurate list was set up. After taking into account all the mergers that took place, 65 companies eventually constituted the population. The questionnaire was sent either via e-mail or normal mail to the marketing managers of these companies. Twenty nine of the questionnaires sent were returned and could be used. This represents a response rate of 44.6%, which is exceptionally high and could be regarded as representative of the pharmaceutical industry of South Africa.

The questionnaire attended to the following principles of new product development:

1) Product innovation
2) New product development and launch tasks
3) Product diffusion
4) Marketing research and development interface principles
5) Organisational issues

The information collected in respect of each pharmaceutical company was the following:

1) Annual turnover
2) Number of products manufactured and marketed
3) Number of employees
4) Number of new products launched during the past five years

1.4 STRUCTURE OF THE STUDY

Chapter one provides an introduction to the study, detailing the background to the study, the objectives and purpose of the study, and also methods of investigation. Chapter two contains a literature review of new product theories. This is followed by a description of new product development processes in Chapter three, which forms the basis for the derivation of a set of new product development principles. In Chapter four a description of the pharmaceutical industry and new product development activities unique to the industry is given. Chapter five describes the design and methodology of the empirical study which was conducted and the results of the empirical study are reflected in Chapter six. The study concludes with Chapter seven, containing the findings of the study and the implications for marketing management education.

1.5 SUMMARY

This chapter provided a brief description of the background to the study, such as a definition of new product development, the role of new product development in an organisation, the development process as well as factors that shorten the lifetimes of products. The objectives and purpose of the study were provided and the method of investigation briefly discussed. Finally the structure of the study was described with a brief reference to the contents of each chapter.

CHAPTER 2
AN OVERVIEW OF NEW PRODUCT THEORIES AND DESCRIPTIONS

2.1 INTRODUCTION

In order to understand the process and practices of new product development it would be important to obtain some clarity on the various theoretical concepts relating to this subject. Various definitions of new products will be identified and categories of new products described according to the viewpoints of both the customer and the firm. Reasons why it is necessary that new product development be undertaken will be discussed and an explanation of different organisational forms suitable for new product development will be furnished. Sources of new product ideas will be given and internal and external methods of generating new product ideas will be discussed. The procedures followed for the development of new products in the pharmaceutical industry will be described briefly.

2.2 DEFINING NEW PRODUCTS.

Numerous definitions and categories describing new products may be found in the relevant literature. For the purpose of this study only a few of these will be mentioned. According to Van der Walt, Strydom, Marx and Jooste (1996:196) new products are those products that are new to the organisation and which are, in one or more aspects, regarded by the target market as being significantly different from the available existing products in the competitive market. Kotler, Armstrong, Saunders and Wong (1996:511) define new products as original products, product improvements, product modifications and new brands that the organisation develops through its own research and development efforts. Lamb, Hair and McDaniel (1998:302) define new products by posing the question as to in what manner these "new" products may actually be considered new. They reply that a product could be new to the world, new to the market, new to the producer, new to the seller or any combination of these.

Howard (1973:336) adopts a different approach to describing new products. Because the customer is the one who would or would not purchase the product, new products are described from the perception of the customer namely that if the change in the product causes a change in

the buyer's behaviour, the product may be regarded as being new. If the buyer hesitates and has to think about the change, it could be regarded as a minor innovation. On the other hand, if the customer directly asks for information with regard to the product and measures this against established norms, then this could be referred to as a normal innovation. Contrary to the latter, Howard (1973:336) refers to a major innovation when a customer is not aware of any other factor against which to measure an innovation,.

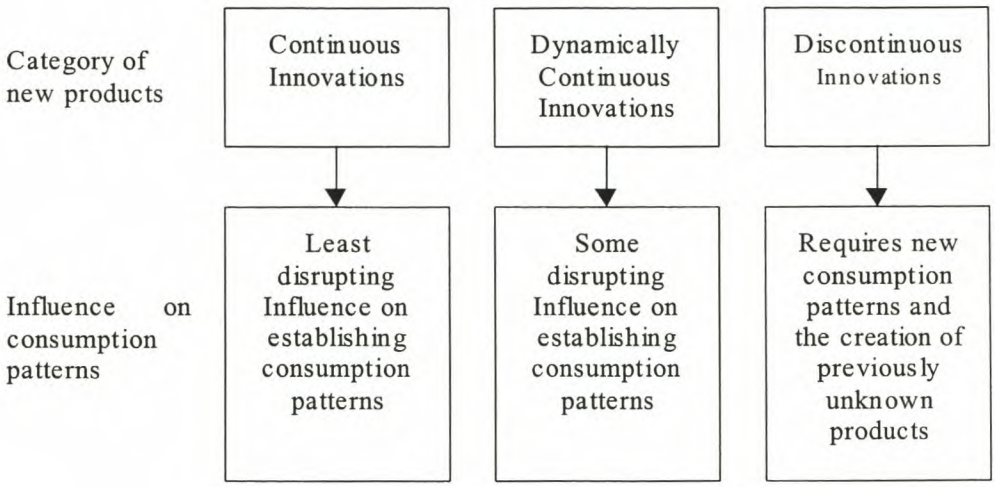
2.3 CATEGORIES OF NEW PRODUCTS

Hisrich and Peters (1984:10-12) argue that when one is looking at new products it should be done from either the customer's or the firm's point of view. It is evident that these two viewpoints could differ to quite an extent.

2.3.1 New products from the viewpoint of the customer

The main reason for the existence of a firm is to satisfy the needs of customers. New products should thus be identified, based on their effect on customers' behavioural patterns. Robertson (1967:14-19) proposed a continuum (see Figure 2.1 below) to illustrate the influence which the use of new products have on established consumption patterns. Most products fall in the continuous continuum, such as style and packaging changes. This category does not have a marked effect on the consumption or behavioural patterns of the customer. Examples of products which fall into the dynamically continuous continuum are for instance the Windows computer software packages. As each edition appears customers have to adapt to the changes. Although these changes may be few, they nevertheless cause a degree of disruption and have an influence on behavioural and consumption patterns. On the other hand cellular phones could be regarded as discontinuous innovations. This category requires a great deal of learning on the part of the consumers, as these products generally perform either a previously unfulfilled function or an existing function in an entirely new fashion. In this category one would often find that a customer has to be persuaded that he/she has a need for this new product. Wind and Mahajan (1997:3) refer to these products as "breakthrough products" and argue that companies should improve the balance between these breakthrough products and the mere changing of products.

FIGURE 2.1
CONTINUUM FOR CLASSIFYING NEW PRODUCTS



Source: Robertson, 1967:14-19

2.3.2 New products from the viewpoint of the firm

It is logical that a firm should classify its new products. In doing so, correct decisions could be made and appropriate product strategies be created. These would in turn contribute to the success of these new products. Johnson and Jones created a new-product matrix for internal new product development by categorising new products on a product and market objectives basis. Van der Walt, Strydom, Marx and Jooste (1996:197) captioned this to illustrate that new products could originate from either a market or technology dimension, or both. Table 2.1 below contains a brief description of this matrix.

Table 2.1 illustrates how firms could identify possible new product alternatives. From this table, eight new-product decisions may be identified. Note that by maintaining the existing position there will be no new-product possibilities. The company could decide on market expansion for example, and with this option new markets are penetrated by changing or modifying existing product items. It may be useful from time to time to describe practical marketing situations in which the firm could apply one of the eight new product decisions.

TABLE 2.1
THE NEW-PRODUCT MATRIX FOR INTERNAL PRODUCT DEVELOPMENT

Increase in newness of technology

Increase in newness of market	**Product objectives / Market objectives**	**No technological change**	**Improved technology** To make better use of the existing scientific knowledge and production facilities of the enterprise	**New technology** To obtain new scientific knowledge and production facilities for the enterprise
	No change in the market	**Maintain the existing position**	**Reformulation** To maintain an optimum balance between costs, quality and availability of raw materials in the specifications of the existing product mix of the enterprise	**Replacement** To replace the components or specifications of the existing product items of the enterprise with new technology
	Deeper penetration into the market To develop the target markets of the existing product items of the enterprise more intensively	**Improve marketing strategy** To increase sales in the existing target markets of the enterprise	**Improve product items** To improve existing product items for greater need-satisfaction and better marketability	**Expansion of product lines** To expand the product lines which are sold to existing target markets with the aid of new technology
	New markets To increase the number of target markets served by the enterprise	**New uses** To find new target markets which could use the existing product items of the enterprise	**Market expansion** To reach new target markets by modifying the existing product items	**Product diversification** To develop new target markets with the aid of new technology

Source: Van der Walt, Strydom, Marx and Jooste, 1996:198

In the section below a brief description will be given of the categories most commonly recognised amongst producers. Before this is done it is, however, important to provide a short description of certain terms for the sake of clarity. According to Kotler, Armstrong, Saunders and Wong (1996:511), it is important not to confuse the terms of "inventions" and "innovations" with each other. Inventions may be regarded as new technology or products, which may or may not gratify the needs of the customer. An innovation, on the other hand, is defined as an idea, product or piece of technology that has been developed and marketed to customers who perceive it as novel or new. In other words, innovation is a process of identification, creating and delivering new product values that did not previously exist in the market. Firms exist in order to satisfy consumer needs and for the purpose of this research, the term innovation will be used.

According to Roberts (1988:13) an innovation can be defined as an invention plus exploitation, where the invention process covers all efforts aimed at creating new ideas and getting them to work. The exploitation process, on the other hand, includes all stages of commercial development, application and transfer, including the focusing of ideas or inventions toward specific objectives, evaluating those objectives, downstream transfer or research and/or development results, and the eventual broad-based utilisation, dissemination and diffusion of the technology-based outcomes.

Bearing in mind the various definitions of new products (described in paragraph 2.2 above) and the distinction between inventions and innovations, the most commonly recognised categories of new products among producers are as follows:

- New-to-the-world products: these products are also called innovations and are unique and original in every way. The first computer and fax machine are two typical examples of the many innovations introduced over decades.

- New product lines: a firm offers these products for the first time thus enabling it to enter new markets. In the literature this category is also described as "new to the producer", "new to the firm but not new to the target market" and "new category entries". Examples of these products are Hallmark's gift items and BMW's Z3 model.

- Additions to existing product lines: these products are line extensions to the firm's current markets, for example Tenston SA (zone aspirin) as a line extension to Tenston.

- Product improvements: these products are an improvement on the existing product, for example air bags in motor vehicles. By exploring the markets for the products, new needs are identified and current products are improved in order to satisfy these needs. Revlon's Color Stay Lipcolor is a good example of a product in this category.

- Repositioned products: these are existing products targeted at new markets or market segments, for instance Zovirax, a medicine shifted from the prescribers' market to the over-the-counter market and now sold as Activir.

Crawford (1991:13) provides some variation to the list of new product categories as mentioned above. These categories are not regarded as standard, but they do provide another perspective on

new product possibilities. The following categories identified by Crawford could also be slotted into the categories mentioned above:

- Solution to a new problem or new solution to an old problem
- New technologies: product improvements involving a technical change
- New to a country: exportations or franchises, e.g. McDonalds in South Africa
- New brand: normally a line extension
- Products for new distribution channels
- Appearance or form improvement
- Resource difference
- Packaging improvement
- Performance difference
- Revival of outmoded category

2.4. REASONS WHY IT IS NECESSARY TO DEVELOP NEW PRODUCTS

In a rapidly changing economic, technological, social, political, international and competitive environment the continuous development and marketing of new products and services have become indispensable to the growth of the modern firm (Van der Walt, Strydom, Marx and Jooste, 1996:196).

One of the main reasons why new product development is of vital importance is because customers are today better informed and thus more demanding than in the past. Firms are consequently forced to continually develop new products in order to satisfy these more demanding customers. Population demographics, values, expectations and customer behaviour change continually, and firms that are not customer focused when making product decisions will not survive.

Increasing competition on both a national and global level forces firms to constantly search for products which would lead to greater customer satisfaction and competitive advantages. As a result of the globalisation phenomenon, firms have to shift their focus from satisfying the needs of local consumers to that of satisfying the needs of both local and global consumers. In this

global information age, firms have access to each other's product information, and thus the emergence of me-too products becomes even faster and the competition harder. The concept of 'time to market' or so called first-mover advantage (Wind and Mahajan, 1997:9) puts pressure on companies to speed up their new product development process in order to exhibit such products at trade shows which in turn dictate the launching of new products. It becomes such a race that a critical question raised in this regard is whether or not some products are not prematurely introduced to the market. Thus, though time to market is extremely important, especially in terms of saving money, it remains indispensable to introduce the right product at the right time.

Even more competition is created amongst those companies with a tendency to shift from mass production to mass customisation. The latter is one of the latest trends in the production world and companies are no longer searching for the optimal product or product line of optimal products. They would rather search for the development of capabilities to allow customers to customise a desired product according to their own needs (Wind and Mahajan, 1997:6).

Rapidly changing technology in telecommunications, computers and information sciences forces firms into new product development to enable them to stay ahead in a world that is moving ever more rapidly every day. The emergence of the Internet and Intranet results in many opportunities to develop new products. A good example of the latter could be the use of the Internet for mass customisation. Customers could design their own product, including the delivery mode, financing and other service options (Wind and Mahajan, 1997:6).

Governments are becoming increasingly involved with business decisions, privatisation, deregulation and co-operation. These are just some examples of emerging situations which in turn could lead to identifying new needs. Political changes in South Africa, for instance, caused an explosion of new ideas for solving the vexing housing problem.

Business practices are ever evolving, such as the tendency of people to work at home which has resulted in the need for information systems that could be used to connect the "home" office with the firm. A sound understanding of the social-cultural-economic context of customers on the part of the company has become imperative.

Modern society requires new products and services to enable it to cope with new developments. The toll-free helpline is a good example of a service which has emerged in order to help

members of society cope with all kinds of situations which could directly or indirectly be a result of our ever-changing world.

Given all the changes mentioned above, is it quite evident that companies cannot rely on their existing product lines and services to sustain growth and profitability. It stands to reason that new product development should be high on any firm's priority list.

2.5 ORGANISATIONAL FORMS FOR NEW PRODUCT DEVELOPMENT

A major challenge facing any firm is to design and implement the most appropriate organisational form to support the new product development process. According to Crawford (1991:408), basic organisational options could be introduced to support new product development, but each project is unique and has its own difficulties and problems. It is, therefore, essential to have the most suitable organisational form in place. The tendency nowadays is to create smaller business units or even profit centres to concentrate on a specific product or product line. All activities are governed in such a manner to save time and money. Some firms offer incentives in order to inspire an intra-preneurial spirit within those organisations, which in turn results in opportunities for both the employees and the firm. Crawford (1991:410-411) suggested a continuum of five choices of an organisational form that could be used for new product firms (see Figure 2.2 below). In functional organisations different departments execute the work, and because each department functions on its own, little innovation occurs. Project organisations organise all the activities around projects, such as those found in property development firms. All decisions are made on the basis that the project is the most important element. In a matrix organisation the employee has to report to both the function manager and project manager, who then have to assess whether the projects fulfil the requirements of both the groups. Crawford distinguishes in the continuum between a functional, balanced and project matrix. In the functional matrix organisation, the firm selects a cross-functional team to develop its products. This team normally consists of one or more members from each function as it is essential to integrate all disciplines in order to ensure that all the important aspects – such as finance, marketing and so forth – are taken into consideration when developing a new product. For situations where both functional and project views are critical, the balanced matrix option should only be taken when it is important for the survival of the firm that neither the functions nor projects are the driver of the firm. Project matrix organisations emerged because certain companies realised that there was a need for stronger project push. In this type of organisation the people are firstly project oriented and secondly functionally oriented. In the venture option, people are taken out of their positions

in departments and delegated to work full time on the project. In the continuum the degree of projectisation is illustrated, where the degree of projectisation is defined as the extent to which participants in the process see themselves as either independent from the project or committed to it. Consequently members of a new product committee are almost totally oriented (loyal) to their functions or departments, whereas spinout (outside) venture members are almost totally committed to the project.

FIGURE 2.2
ORGANISATION TYPES FOR NEW PRODUCTS

Options				
Functional (with / without committee)	Functional Matrix	Balanced Matrix	Project Matrix	Venture (inside, outside)
0%----------20%----------40%----------60%----------80%----------100%				
Degree of projectisation and commitment to project				

Source: Crawford, 1991:411

Larson and Gobeli (Crawford, 1991:413) evaluated 540 projects according to the different organisation options described in the section above. The results of this study (see Table 2.2) clearly indicate that the venture option is the most successful (94% successful or marginally so). This is not, however, significantly better than the project matrix, though significantly better than the functional option.

TABLE 2.2
PERFORMANCE SUCCESS OF THE FIVE BASIC NEW PRODUCT ORGANISATIONAL OPTIONS

Organisational option	Percent of projects	Percent successful	Percent successful or marginally so
Functional	20%	32%	63%
Functional matrix	34	41	79
Balanced matrix	23	58	88
Project matrix	20	62	92
Venture	14	62	94
Total	100%		
Total projects: 540			

Source: Crawford, 1991:413

Deciding on the correct organisational form is not all that easy. Crawford (1991:418) provides a useful guideline, shown in Figure 2.3. to aid decision making. The array depicted illustrates how the various options differ on each of several operating characteristics. The three matrix forms are at points between the extremes of functional and venture. Another guideline is depicted in Table 2.3. This table shows some decision rules for making choices among the five basic organisational options. Other factors could be added to this table and these factors could also be weighted.

FIGURE 2.3
OPERATING CHARACTERISTICS OF THE BASIC ORGANISATIONAL FORMS USED FOR NEW PRODUCT DEVELOPMENT

Operating Characteristics	Spectrum of Options				
	Functional	**Functional Matrix**	**Balanced Matrix**	**Project Matrix**	**Venture**
Decision power of leader	Very little ----------				---------- Almost total
Independence of group from departments	None ----------				----------Total
Percent of time spent on one project by member	Very low ----------				----------Total
Importance of project(s)	Low ----------				---------- Critical
Project(s) focus	Total list----------				---------- One
Degree of risk of project(s) to firm	Low ----------				---------- High
Disruptiveness of project(s)	Low ----------				---------- High
Degree of uncertainty in most decisions	Low ----------				---------- Very High
Ability of team to violate company policies	None ----------				---------- Almost total
Independent funding	None ----------				----------Total

Source: Crawford, 1991:418

In the operational field product attributes are often referred to as either order winners or order qualifiers. The latter refers to those characteristics of products that are needed and expected automatically by the customer. Examples of qualifiers include quality, low cost and differentiation. Order winners, on the other hand, refer to those qualities that influence a customer to order from a firm or not; the most important order winners being speed and flexibility. This need for speed and flexibility calls for a new way of managing the new product development process. There is now a tendency amongst producers to use concurrent development processes rather than the well-known sequential development process. Under the sequential development process the project moves sequentially from one phase to another. The typical phases are concept development, feasibility testing, product design, development process,

and pilot production to the final product. Under this method the functions are specialised and segmented, everyone is responsible for a particular task and little integration takes place.

TABLE 2.3
DECISION RULES FOR CHOOSING AMONG THE FIVE BASIC ORGANISATIONAL FORMS USED FOR NEW PRODUCT DEVELOPMENT

The following questions are answered by awarding a score from 1 to 5 to each answer. A score of 1 represents a term such as low, little, not much	
SCORE	**FACTOR**
	1. How difficult is it to get new products in the firm?
	2. How critical is it for the firm to have new products at this time?
	3. How much risk to personnel is involved in this new products work?
	4. How important is speed of development?
	5. Will the products be using new procedures in their manufacturing?
	6. In their marketing?
	7. What will the Rand profit contribution from each of the new items be?
	8. How much training do our functional people need in the markets represented by the new products we want?
	TOTAL SCORE
If the score is below 15, then functional or functional matrix would probably work. From 15 to 30, the firm probably needs a balanced matrix. Situations scoring above 30 probably require a project matrix or even a venture approach.	

Source: Crawford, 1991: 417

2.6 SOURCES OF NEW PRODUCT IDEAS

To achieve a sustained competitive advantage and success in a dynamic market, firms should continually introduce new products. In order to introduce new products firms need to be continually vigilant for new ideas. Generating new ideas could also be termed the invention component of the innovation, as mentioned by Roberts (1988:13), who described an innovation as an invention plus the exploitation of that invention. What follows is a brief discussion on the sources and methods of generating new ideas.

Ideas for new products could be generated from various sources, either inside or outside the firm. Internal sources of ideas could refer to any employee of the firm in any of the various functional departments. Some firms have suggestion boxes and others use incentive systems to stimulate and encourage new product ideas. External sources could refer to any person or persons outside or not working for the firm. Customers could be very helpful in providing new ideas or making suggestions for viable improvements. Suppliers could and should play a very important role in

the development process of co-design and co-development, because in this process co-operation would benefit both parties. Earlier supplier involvement, originating as early as the idea generation phase is becoming a modern trend in manufacturing. Distributors could also make a meaningful contribution in the search for new product ideas. Other possible sources include the market place, other industries, the media and the Internet, to name but a few. To survive in an increasingly competitive market, firms need to be constantly alert and on the continual lookout for new product ideas and possible product improvements to enable them to stay ahead of other competitors and to establish a sustained competitive advantage.

2.7 METHODS AND SOURCES FOR THE GENERATION OF NEW PRODUCT IDEAS

As mentioned above, the sources of new product ideas exist either within or outside the firm. What follows is a broader discussion of the various internal and external sources.

2.7.1 Internal sources

It is of the utmost importance to encourage the spirit of entrepreneurship within firms, as this encourages both intrapreneurs or persons to propose new ideas and also those who are continually searching for better ways of doing things. Roberts (1988:15) differentiated between people who are idea-havers and those who are idea-exploiters; the latter being those people who conceptualise ideas and then exploit the opportunities. A mere abstract idea has little value for a firm; but it is the idea, product or technology that has been marketed to customers who perceive it as novel or new, which has value for a firm (Kotler, Armstrong, Saunders and Wong, 1996:516). According to Pinchot (1989:15) intrapreneurs are the people of courage and conviction within firms. A purposeful effort should be made to retain the service of these people and to provide them with the wherewithal in order to continue being creative. Idea-havers may be found in any discipline, but most people would probably not offer their ideas to the firm unless they sense that there is a likelihood that they would be rewarded. This is not to say that the idea-haver needs to be an idea-exploiter, since firms normally appoint a team to exploit viable product ideas. Depending on the situation, in certain instances the idea-haver could be included in the project team, and could even be the leader of this team. This recognition in itself could be a great motivation for employees to propose new ideas to their firms.

Incentive systems should be implemented to motivate people to come up with new product ideas or to propose new solutions to old problems. Some companies have "employee of the month/year" rewards; others promote people and some even award cash bonuses or other gift rewards for new ideas.

The firm 3M is regarded as one of the most innovative companies in the Western world. This firm applies the so called "15 per cent rule" which allows all employees to spend up to 15 per cent of their time working on projects of personal interest, whether these projects benefit the firm or not. A venture team is formed consisting of the researcher who conjured up the idea, and volunteers from the manufacturing, marketing, sales and legal disciplines. This team would "nurse" the project until it either succeeds or fails. 3M also believes in the cross-fertilisation of information amongst business units. By diffusing information across the organisation, this encourages fertile minds to apply their skills. Certain developments may be of great help to others by saving them valuable time on issues already solved (Kotler, Armstrong, Saunders and Wong, 1996:516).

In their efforts to introduce successful new products, some companies assign two teams for every viable new idea. This approach is termed twin projects/teams. These teams operate separately and depending on the firm's policy, a thorough evaluation is done when the process has reached a certain stage. Once this stage has been reached the team with the best alternative is given the go-ahead. Pinchot (1989:15) identified a number of ways in which intrapreneurs could be encouraged within a firm:

- Identify employees who express passionate beliefs in certain projects and empower them to act on these beliefs.
- The intrapreneur should be permitted to follow the project through to completion.
- Give intrapreneurs sufficient authority to make their own decisions with regard to the project.
- Provide freedom and resources to experiment with, give them discretionary help, resources and time.
- Tolerate risks, mistakes and failures.
- Form cross-functional teams to support these intrapreneurs.

The Japanese frequently use cross-functional teams. A commonly used method is the Quality Function Deployment Technique. This involves selecting a competitive brand as benchmark and the buyers of these products are asked what they like and do not like about this product. By using reverse engineering the firm's own product is changed until it satisfies the customers' needs. This is a continual process in an attempt to satisfy customer needs (Slack, Chambers, Harland, Harrison & Johnston, 1995:175).

2.7.2 External sources

Various external sources are available for possible ideas for new products. The different sources will be discussed briefly below.

2.7.2.1 Customers

Profitable and successful firms are the result of satisfied customers and it is thus logical that customers are one of the most important sources of new ideas. The main goal of any firm is to satisfy the needs of its customers who in turn, through their support, make the firm profitable. Relationship marketing has become essential as it allows firms to develop healthy relationships with their customers. A healthy relationship between a firm and its customers enables the firm to get to know its customers better, anticipate their needs and to produce products accordingly.

An understanding of the socio-technological context of innovation is important. Technology is the facilitator that enables the development of products and services and helps to shape customers' needs. Technology in itself seldom offers a solution. Clients do not buy technology, but products or services to gratify their needs or solve their problems. Thus an understanding of the socio-technological environment in which technology operates is rather critical to the effective design and launching of new products and services (Wind and Mahajan, 1997:5).

Hamel and Prahalad (1994:6), in a contrasting viewpoint, suggest that companies should ignore customers. They argue "we did not know we wanted mini-vans, mid-size Japanese cars of unrivalled quality, 24 hour TV news, walkmans or sensibly priced computers sold without hype until innovative companies put them in our hands". Hamel and Prahlad perceive customers as focusing on short-term needs and neglecting the longer-term implications or possibilities of those needs. In order to solve this problem, customer ideas should be considered from a long-term perspective.

Several methods of how to generate new product development ideas with the aid of customers are explained in the next paragraphs.

Marketing research: The marketing department of a firm normally undertakes research. This allows it to collect more information on the customer, anticipate his/her needs and identify possible new product opportunities to satisfy these needs. Apart from identifying new opportunities, market research could also result in identifying new solutions to old problems. When referring to marketing research, the question is often posed whether qualitative or quantitative research should be done. Many successful new product developments use both qualitative and quantitative methods. Opinions do, however, vary with regard to which method should be preferred. It stands to reason that neither of these methods should be used in isolation, but rather in a complementary manner. Craton, Lodge and Knights' approach (McKenzie 1996:62) to market research is an example that uses both methods. Their method starts with an exploratory phase, which is nearly always quantitative, followed by an executional phase, which could be either qualitative or quantitative, or both. Finally, the evaluative phase, which is normally quantitative, takes place. Research International employs a system called the MicroTest. This test is ideally used as a measuring trial for a new product or the repeat purchase of new products (McKenzie, 1996:61-63).

After-sales service: There is much truth in the statement that a complaining customer is worth his/her weight in gold. By listening to customers and responding to their complaints, products and services provided could be improved to the extent that repeat complaints may be avoided and customer satisfaction thereby ensured. A constant flow of information should occur between a firm's after-sales service division and the research and development department. The inclusion of after-sales and research and development personnel in cross-functional teams provides an alternative which would improve the flow of information between these departments.

Informational links: Database marketing also bolsters a firm's ability to develop new products. Up-to-date databases are invaluable to inform the firm as to its typical customers. An on-line connection with customers, such as an electronic data interchange system, is one of the ultimate ideals, since this is a good way to nurture a customer relationship. The Internet is another very effective way of reaching the customer, even more so because those who are really interested would visit the site. It is of the utmost importance that such sites are up to date at all times and include features that would capture the customer's attention. The website of General Lighting Sylvania is an example of a site which includes features that elicit favourable responses on the

part of customers. Sylvania once had a home walk through section. On this basis it developed six areas of a cyberspace house that may be visited. These sections include exterior areas, living room, childrens' bedroom, master bedroom, kitchen and bathrooms. One could move from area to area by clicking on the floor plan. After arriving in a chosen area, one would click on any object depicted in colour on the drawing of the area to learn about the design considerations for lighting for that application (http:// www.sylvania.com).

Co-specialisation and development: A development process involving co-specialists could be beneficial for both the customer and the firm and numerous new products have seen the light as a result of this type of co-operation. This example of development partnership becomes important especially when launching new products. The 20-80 principle is applicable here. Since 80% of the sales emanate from 20% of the customers, it is worth the firm's while to identify this crucial 20% of customers. Once a product has been launched on the market and an enthusiastic minority is buying such products, the good news will invariably spread. If a firm is in a position to co-develop products with some of the 20% of its customers, this would clearly add value to the firm's efforts (Thrift, 1997:20).

Beta testing: This type of testing is the phase that follows alpha testing, which is the in-house testing of a new product or service. Beta testing, on the other hand, is the testing of this new product or service with the active involvement of customers or potential customers. This type of testing is quite a well-known method in the computer industry. Researchers, however, concluded that whilst doing this type of testing, little attention was given to whether the new product met the needs of customers nor how cost effective it was or how the various customers adjusted to the new item. These shortcomings then led to a new type of testing being developed, namely gamma testing. To pass this test a new product has to meet the needs of the customer regardless how long this process may take. Although this type of testing is the ideal, it is clearly time consuming and expensive and is, therefore, not employed very often (Crawford, 1991:222).

Consumer laboratory visits: Many companies spend a great deal of time, effort and money on consumer laboratories. There is a major need for developing ways of informing and educating customers on the capabilities of innovative products and their likely impact on their lives. Virtual reality through simulation and multimedia becomes an important component of capturing consumer reactions to innovative products and services (Wind and Mahajan, 1997:3). By mobilising the power of technology some firms have developed design laboratories. These laboratories obtain customers' reactions to product ideas and concepts. By doing this it is

possible to provide immediate, direct and testable recommendations within hours (Wind and Mahajan, 1997:4). A good example of how effectively and efficiently these consumer laboratories could be used is Osram's consumer laboratory. Osram is one of the three leading lamp manufacturers in the world. Osram's customer visit site is called Lightpoint and is in itself a rather innovative method to inform customers. This is an amalgam of museum, laboratory, TV studio, classroom and retail environment, and these are dedicated to teaching the art and science of lighting. With the aid of instructions and information visitors could observe in the museum how lighting affects our lives. The multi-purpose room is used for teaching fundamentals as well as application training and product demonstrations. Demonstrations of vision, optics and units of measure could also be viewed. The most frequently asked questions are also answered. The applied technology wall demonstrates technical aspects of lamps and ballasts. This wall was constructed to answer questions posed by specifiers, utilities and end-users regarding all aspects of light. The Visual Performance Room is used to demonstrate office lighting and visual performances. This doubles as a computer room. Six separately controlled fluorescent luminary systems demonstrate the effects of indirect lighting, direct lighting, wall washing, directional down lighting and combinations of the above mentioned alternatives of lighting. A separate space is dedicated to the showing of retrofit alternatives.

Concept tests, focus groups, interviews: When a firm develops an idea for a new product or service, it often tests the new concept by conducting focus group discussions with customers to obtain new product feedback from those who would eventually purchase the products. Personal interviews could also be undertaken because bright ideas are often suppressed when an individual has to react in a one-on-one situation.

Trade shows: Certain industries hold annual or bi-annual trade shows during which they present new products. Some even present several prototypes which are tested at the show by asking customers for their comments and by closely observing their attitudes. Many Japanese companies use these trade shows to ascertain what price the customer would be prepared to pay for a new product. This is called target costing. Having determined the ideal price, such firms would typically apply value engineering to enable them to produce this product at that price.

User group feedback: It is once the customer actually starts to use the product when frustrations readily arise, which in turn lead to ideas for improvements. Feedback from these customers is an invaluable tool for the firm.

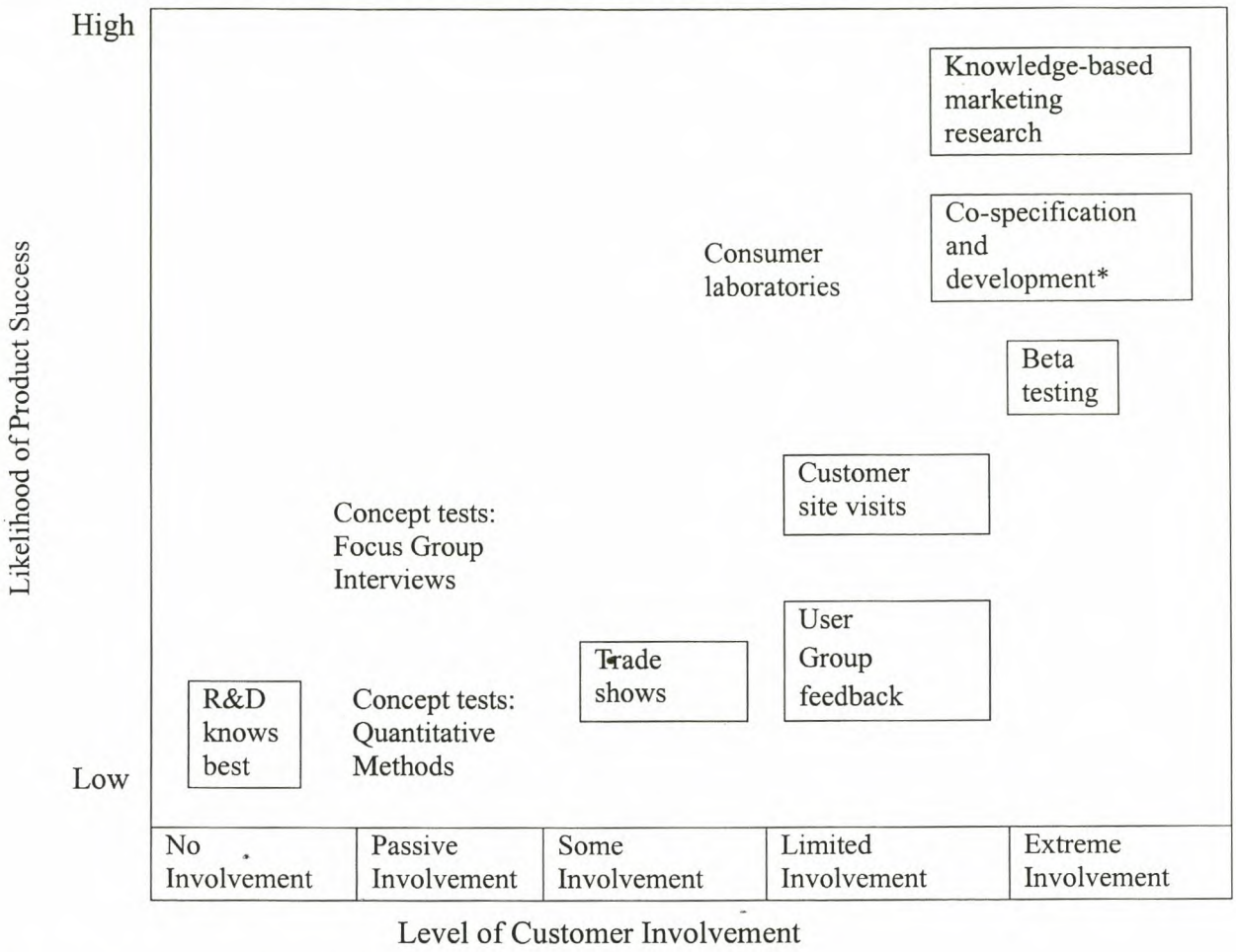
Opinion leaders: Opinion leaders are customers who should be handled with care. These people normally enjoy a certain status in the industry and other customers highly value their opinion regarding products. Medical practitioners are the recognised opinion leaders in the pharmaceutical industry. A good example of a firm which uses opinion leaders to its benefit is Innogenetics N.V. (a Belgian firm). Innogenetics N.V. is an established biotechnology firm engaged in the research, development and marketing of diagnostic products for human diseases and in the discovery and development of therapeutic products. The firm identifies these opinion leaders by interviewing people in the field, by visiting laboratories, by searching for the number of publications certain experts may have written and by visiting scientific congresses. The opinion leaders are subsequently approached in a scientific way. Several visits and discussions are held in order to persuade them to accept the new techniques or tests suggested by Innogenetics. This is an expensive and time consuming process since Innogenetics often has to pay for extra tests, needed to persuade these opinion leaders. When these opinion leaders (often engaged in university laboratories) accept the new product, they would normally start promoting the innovative techniques at symposia or congresses. In the pharmaceutical industry other customers would only purchase such products once they have read or heard positive statements from these opinion leaders.

Wind and Mahajan (1997:9) suggested that researchers should redefine marketing research and modelling beyond the traditional scope of qualitative methods in order to encompass all approaches to the acquisition of knowledge about customers and the other key stakeholders. In Figure 2.4 the likelihood of product success because of a certain degree of customer involvement is depicted. If the likelihood for product success, for instance, is low and there is some involvement on the side of the customers, it should be considered to employ trade shows as the external source.

2.7.2.2 Suppliers

The ideal is to obtain information, solutions and opinions about new products and services from all the different members in the value chain. It often happens that suppliers of raw materials or components present some exciting solutions and ideas with regard to new products. By fostering good relationships with such suppliers or even including them in the cross-functional teams, cheaper and better products or services may be conceived.

FIGURE 2.4
CUSTOMER INVOLVEMENT IN NEW PRODUCT DEVELOPMENT



Source: Wind and Mahajan, 1997:9

Clark (1989:124-163) undertook a study on the involvement of suppliers in new product development in the Japanese motor vehicle industry and came to the following interesting conclusions:

- Many unique parts and intensive supplier involvement in engineering account for a significant advantage in lead time and cost.
- Supplier involvement and stronger supplier relationships account for approximately one-third of the personnel hours advantage and contributes to four to five months' lead time advantage. A strong network of suppliers enables many Japanese firms to use more unique parts in their designs, thus improving the performance of their products.

2.7.2.3 Competitors

A firm should know its competitors just as well as it knows itself. The production of me-too products often occurs after the emergence of a new product by the competitor. When a firm keeps careful tabs on the marketplace it is easier to learn what its competitors are up to. A firm's good relationship with the customer could also be a good source of information about its competitors. A comparative analysis of the firm's own products versus those of competitors could lead to endless alternatives and opportunities. Producers buy competitors' products and by dissecting them, they obtain a great deal of information. Some companies sell technology ideas and concepts to competitors in order to encourage competitors' research and development departments to become "lazy". Some companies maintain a world wide up-to-date database of their competitors and their activities.

2.7.2.4 Other sources

Previous projects could be a source of important new product ideas. The firm 3M, for instance, built a database of lessons from in-house post mortems on new product development projects. Opinion leaders may nudge companies in the direction of excellent ideas. Products often become popular because of the connection with a certain highly regarded opinion leader. Market analyses, trade shows and trade magazines, seminars, government agencies, universities, advertising agents and new-product consultants, to name but a few, may be the sources of great opportunities for new products.

Drucker (1985) also identified several sources for innovative opportunities, and these include:

- The unexpected: Bloomingdales (a retail store in New York), initially focused on fashion. In the 1950s appliance sales began to mount and, realising that this could be an opportunity, opened Housewares Departments. By doing so, Bloomingdales moved from number four in the market up to number two.
- The incongruity: An incongruity is a discrepancy between what is and what everyone assumes it to be. An example of incongruity between perceived and actual customer values and expectations is the Japanese who thought that the poor would not buy television sets because these were too expensive. At this particular stage the poor in the US and in Europe had already proven that the medium of television satisfied expectations which had little bearing on traditional economics.

- Process need: This starts where the job is to be done. It is an obvious need, everyone knows about it, and once the innovation has been made everyone accepts it as standard. Examples are the invention of the light bulb, the fax machine, e-mail facilities and many such like accoutrements.
- Changes in industry or market structure: The health industry is an example in this respect. In the past many physicians practised on their own. Nowadays many of them would practice in a partnership with other medical doctors or together with other paramedical practitioners, such as physiotherapists and occupational therapists.
- Demographics (defined as population, its size, age structure, composition, employment, educational status and income): The tendency of comparatively large numbers of South African girls to go overseas to work as au pairs, because of not all of them could afford to study, combined with the limited job opportunities in our country, created an opportunity for the establishment of au pair agencies in order to help these girls to locate acceptable families for whom they could work. On the other hand people searching to employ au pairs in other countries may contact these agencies and inform them exactly of their needs and expectations.
- Changes in perception: The tendency of people to be more health and fitness conscious is an excellent example of change in perception, from not being interested to do much to improve one's health to the present perception that one has an important role to improve one's health.
- New knowledge, both scientific and non-scientific: Many examples could be quoted such as: the development of the theory of chemotherapy by Paul Ehrlich; the invention of the punch card by Hermann Hollerith; the implementation of robotics and factory automation by Ford Motor Company, and so forth.

2.8 SUMMARY

This chapter started by defining new products, it provided a number of different options as defined by several authors and explained the difference between invention and innovation. Inventions could be regarded as new technology or products, which may or may not gratify the needs of the customer. An innovation, on the other hand, could be defined as an idea, product or piece of technology that has been developed and marketed to customers who perceive it as novel or new. In other words, innovation is a process of identification, creating and delivering new product values that did not previously exist in the market. Then categories of new products, such

as new-to-the-world, additions and product improvements, were described. New products were subsequently discussed, firstly from the viewpoint of the customer and then of the firm.

The importance of the customer in the new product development process was illustrated. Organisations could use several methods to obtain customer information in order to meet their needs, which include user group feedback, after-sale service, informational links and opinion leaders. The importance of new product development was highlighted. Rapidly changing economic, technological, social, political, international, competitive environment, and also the well informed customer were only a few reasons why new product development was crucial for all organisations. Both internal and external sources of new product ideas such as an intrapreneurship, clients, suppliers, competitors were identified, as well as other methods for the generation of new product ideas.

CHAPTER 3
NEW PRODUCT DEVELOPMENT PROCESSES

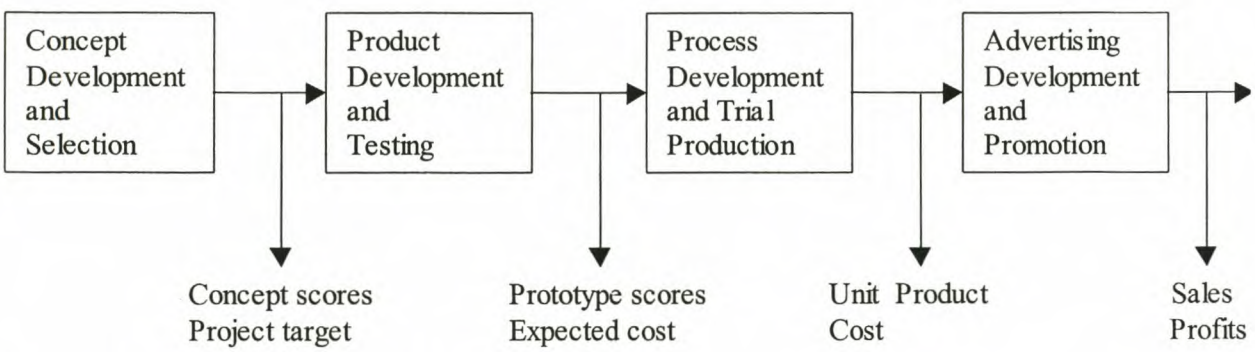
3.1 INTRODUCTION

A number of different new product development processes – or so-called product creation processes –may be identified. In this chapter a few examples of such conventional processes will be discussed. This will be followed by a brief description of the different steps in the new product development process as suggested by Kotler, Armstrong, Saunders and Wong (1996:514). In paragraph 3.3 the unconventional new product development process, namely the concurrent process commonly used in Japanese firms, will be analysed. The last part of this chapter will attend to cross-functional teams.

3.2 THE CONVENTIONAL NEW PRODUCT DEVELOPMENT PROCESS

Figure 3.1 illustrates a typical new product development process, and it is noticeable here that the new product strategy, idea generation and idea screening are not regarded as part of the new product development process. Figure 3.1 indicates the outcomes of each step, such as the concept scores (the scores which the different customers award to the concepts of the new product for which they have a strong appeal) and project target (projects are normally aimed at a specific target), after concept development and selection had taken place.

FIGURE 3.1
THE FIRM'S NEW PRODUCT DEVELOPMENT PROCESS



Source: Cohen, Eliasberg & Ho, 1997:122

Crawford (1991:25-35) suggests five steps in the new product development process:

1) Strategic planning stage

2) Ideation stage

3) Screening stage

4) Development stage

5) Commercialisation stage

The five different stages mentioned above involve a large amount of detail. These details are set out in Appendix 1.

Van der Walt, Strydom, Marx and Jooste (1996:200) on the other hand, argue that the new product development process consists of eight steps:

1) Organisation for development

2) Development of ideas

3) Screening of ideas

4) Concept development

5) Profitability analysis

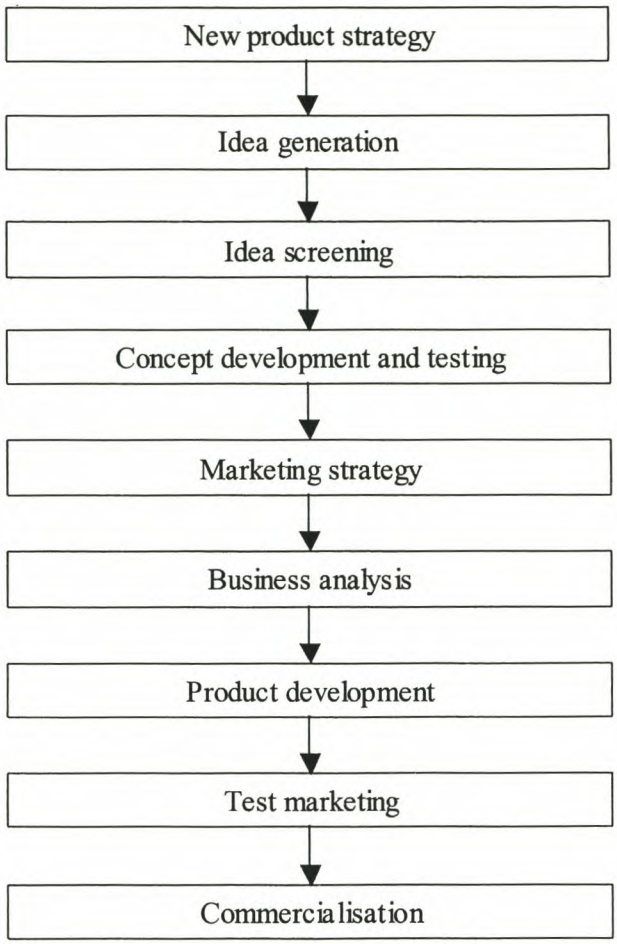
6) Physical product development

7) Test marketing

8) Commercialisation

The process suggested by Kotler, Armstrong, Saunders and Wong (1996:514), and depicted in Figure 3.2, could perhaps be regarded as the better structured new product development process when compared with the processes suggested by Cohen, Eliasberg and Ho on the one hand and Van der Walt, Marx and Jooste on the other hand. It is evident that not all of the other processes mentioned include a step relating to the need that a strategic-analysis be done. Such a step would force top management to think strategically regarding new products and is, therefore, important to such a process. A brief discussion of all the different steps, as Kotler, Armstrong, Saunders and Wong (1996:200) suggested, will be given below.

FIGURE 3.2
STEPS IN NEW PRODUCT DEVELOPMENT



Source: Kotler, Armstrong, Saunders and Wong, 1996:200

3.2.1 New product strategy

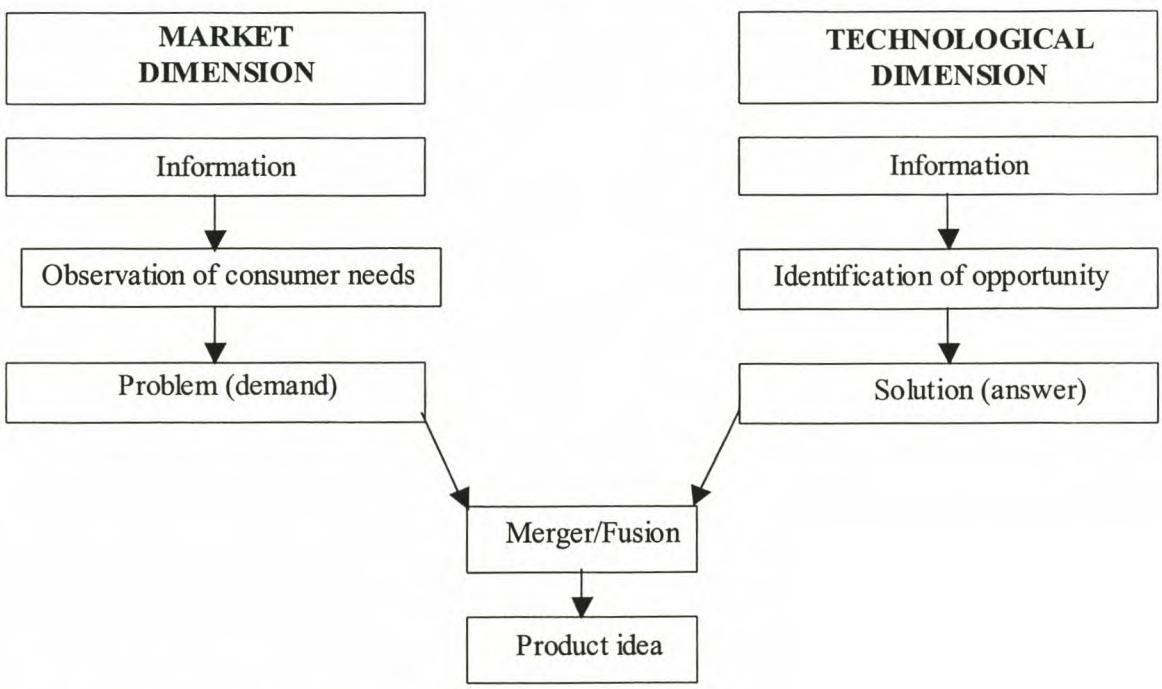
Top management should determine a product strategy for every product before the new product development process takes off. This will ensure that all the activities of the project programme have a specific direction and are focused towards a goal. Without direction team members may tend to work inefficiently. It is important that there should be a strategic fit between the corporate and business strategy of the firm. A new product strategy achieves the following goals: it focuses the team effort; it brings about integration of functional or departmental effort; it acts as a delegation tool by letting team members operate independently, efficiently and effectively while remaining integrated with the rest of the team, and ultimately it requires pro-active management which in turn fosters innovation. Though the importance of this step is rather

obvious it is interesting to note that most of the new product development processes mentioned ignored this step.

3.2.2 Idea generation

Ideas should be generated bearing in mind the firm's macro-, market and micro-environment. This process should be executed in a continual, purposeful, determined and effective fashion. This is a critical step, since the ultimate new product could be an improvement upon the original idea on which it was based. The launching pad of idea generation is establishing what the customer wants. Often companies proceed on gut feel by anticipating what the customers want, and sometimes they create a product which customers will in time learn to appreciate, such as cellular phones. The main goal is to obtain that strategic fit between what the customer wants and the product idea. Van der Walt, Strydom, Marx and Jooste (1996:202) argue that the manner in which a firm would satisfy its customers' needs depends on its internal strengths and weaknesses, especially on its technological capabilities. In Figure 3.3 the relationship between the market and the technological dimension is illustrated and it is evident that both these dimensions depend on accurate information.

FIGURE 3.3
THE RELATIONSHIP BETWEEN THE MARKET AND TECHNOLOGICAL DIMENSIONS OF A PRODUCT ITEM DURING THE DEVELOPMENT OF PRODUCT IDEAS



Source: Van der Walt, Strydom Marx and Jooste, 1996:202

3.2.3 Idea screening

The objective of this phase is to reduce the ideas that have been generated to a manageable few which are worthwhile of being examined in depth. In this phase a first feasibility study becomes necessary. The development of new products is a costly process and a firm cannot afford producing new products just for its own sake. Kotler, Armstrong, Saunders and Wong (1996:519) identified the following crucial questions which should be asked before considering to proceed to the following phase:

- Does the product strategy fit in with the firm's strategy and objectives?
- Does the firm have the necessary marketing skills and experience?
- Does the firm have sufficient financial resources?
- Are the existing distribution channels sufficient or does the firm need to establish new ones?
- Does the firm have the necessary production capabilities?
- Would research and development be able to design a proper product?
- Would the current suppliers be able to provide the needed components or raw material or would the firm need to seek for new or alternative suppliers?

If the firm is positive that it has obtained satisfactory replies to the above mentioned questions, it may proceed to the next phase of concept development and testing.

3.2.4 Concept development and testing

The first step in a long chain of actions entails the initiation of some research preparation, since the innovation is likely to need certain raw materials and specific manufacturing equipment in order to be manufactured. After addressing this issue, the real development phase may start. The main objective of this phase is to develop the product idea into several product concepts. It is important to note that at this stage the product concept is still on paper and no physical product has as yet been created. Integrating unique product characteristics with certain consumer needs and actions in a specific fashion eventually result in product concepts (Marx, Van Rooyen, Bosch & Reynders, 1998:245). It is thus important to involve customers from an early stage to ensure that the product would meet their needs. This could be done by conducting concept

testing, which is the testing of new product concepts with a group of target consumers to ascertain what degree of appeal these concepts may have to customers. This type of testing produces valuable information as to where and how to alter the product to perfection to reflect the customer needs and expectations.

Suppliers could also render a valuable service by scrutinising whether their components and raw materials would fit in with these innovations (Crawford, 1991:30-32). The technical feasibility of manufacturing the product at an acceptable cost should also be thoroughly examined. Some companies employ simultaneous engineering techniques in order to accelerate the development process.

It is furthermore important to assess whether the product is durable, since longer lasting products virtually invariably become market leaders. Such a fact is a valuable adjunct in the promotion of these products.

3.2.5 Marketing strategy

The marketing strategy is the marketing logic by which the organisation or business unit hopes to achieve its marketing objectives. A marketing strategy has to be developed at this stage in order to introduce the product to the market. This strategy consists of a three parts mix (Kotler, Armstrong, Saunders and Wong, 1996:521-522):

1) The first part describes the target market, the planned product positioning as well as the sales, market share and the profit goals for the first few years.

2) The second part outlines the product's planned price and marketing budget for the first few years.

3) The third part describes the planned long-run sales, profit goals as well as the marketing.

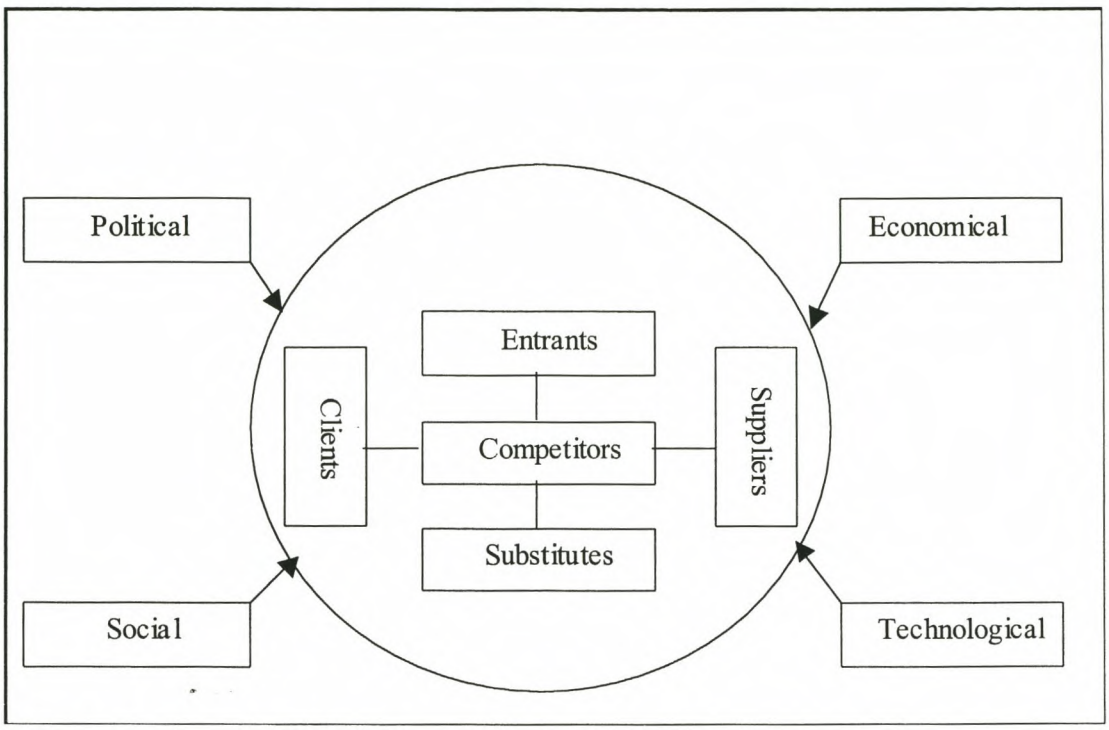
The marketing person or team responsible for the project would also need to decide on issues such as the product's packaging, branding, labelling, pricing, promotion, and distribution strategies.

3.2.6 Business analysis

The well-known SWOT-analysis is normally used to analyse the business and the environment in which the relevant business operates. The Porter-5 forces model may be used for an environmen-

tal analysis. Heene (1997) suggests that the best way of undertaking a SWOT analysis is to use an extended Porter model, as depicted in Figure 3.4.

FIGURE 3.4
THE COMPETITIVE FORCES: AN EXTENDED PORTER MODEL



Source: Heene, 1997

Heene (1997) suggests several issues that are important to consider when an extended model is used for a SWOT-analysis. These are:

Barriers to entry

- capital requirements
- economies of scale
- learning curves
- product differentiation
- switching costs
- over capacity
- monopolies
- government

Barriers to exit

- rest value of fixed assets
- government
- regulations
- social liabilities
- marginal contribution
- shared costs
- emotional barriers

Clients and suppliers (bargaining power)

- turnover
- availability
- impact on costs
- product standardisation
- switching costs
- profitability
- threat of vertical integration

Substitution

- functionality
- costs
- ease of use
- reliability
- maintenance
- compatibility

Competitors (intensity of rivalry)

- market growth

- pattern of demand
- possibilities to differentiate
- competitors' strengths
- mentality
- fixed costs-inventory costs
- capacity management
- barriers to exit

Political

- import and export barriers
- legislation
- taxes

Technological

- electronical data interchange for communication improvements
- databases for direct mailing, relationship marketing
- new production techniques
- just-in-time
- cross-docking

Social

- demographic trends and tendencies
- mobility

Economic

- position in the economic life cycle

Once the above elements have been analysed, a firm should be in a position to identify several opportunities and also threats, if any. The firm will also be in a position to be aware of its

strengths and weaknesses with regard to the exploitation of the possibilities which the new product offers.

3.2.7 Product development

Leading up to this stage the product only exists in a word of description, a drawing or a crude mock up. In this phase the product concept is developed into a physical product or prototype. An investigation is undertaken to ascertain whether the current machinery would be sufficient to manufacture the new product. The firm normally does capacity measurements. Sometimes linear programming is used to determine which products – the old or the new – would be more profitable and should, therefore, enjoy priority in terms of access to the machinery's manufacturing capacity. Several prototypes are produced and functionality tests are conducted under both laboratory and field conditions. Apart from taking the needs of the customers into consideration, the product's manufacturability is of considerable importance. Many firms follow a more recent approach with great success, which is termed the design for manufacturability and assembly (DFMA) to aid such firms in their manufacturing decisions. The DFMA enables them to fashion products which are both easy to manufacture and satisfy the needs of customers (Kotler, Armstrong, Saunders and Wong, 1996:524-525).

According to Van der Walt, Strydom, Marx and Jooste (1996:210) several other aspects should be considered at this stage of the new product development process. These aspects are:

- decisions on the extent, duration and aspects regarding warranties as well as after-sales services of the new product or service
- patents to be registered
- legal requirements and regulations regarding safety, pollution, ingredients and instructions for use
- submission of the product or service to the design institute of the country's standards authority (in South Africa the SABS), for evaluation and recording in the list of acceptable products

- the implementation of the dimensional and qualitative standardisation of certain technica attributes of the product have to be considered in order to utilise the advantages o standardisation
- selection of a trademark for the product or service
- packaging decisions .

3.2.8 Test marketing

Test marketing may be defined as the limited introduction of a product and a marketin programme to determine the reactions of potential customers in a market situation (Lamb, Hai and MacDaniel, 1998:309). The main objective of this phase is to test the product itself in rea market situations. By doing so the firm could identify potential problems and also any possibl improvements which may be advisable. Consumers' and dealers' reactions on handling repurchasing and usage are captured and could be useful for further development. Sufficien information is needed before the important final decision is taken to introduce the products to th entire market. Thorough test marketing would give management an indication of how successfu this new product is likely to be. The amount and type of testing depend on the firm and on th type of product. Some products are tested, withdrawn, changed and re-tested many times befor being officially launched. Different types of tests are done for different types of products. Th following tests could typically be performed when testing consumer products: standard tes markets or controlled test markets and simulated test markets. On the other hand, when testin industrial goods, the following tests are often done: product-use test, trade shows, distributor an dealer display rooms, including standard or controlled tests markets.

A short description of each test will now follow. It should be noted that these are only a few o the possible tests and that the advantages and disadvantages of each method will not be describe here. Such tests entail a limited introduction of the new product together with the differen strategies in order to test the reactions of the customers and potential customers in a real marke situation. A locality should be identified which would represent the actual market as closely a possible. Laboratory tests are often done and aspects such as customer safety, durability and lif expectancy of the products are tested, and should be tested in several ways (Lamb, Hair an MacDaniel, 1998:307-309). Manufacturers also need to conduct a testing programme to ensur that their products conform with the established safety standards of any product safety act.

Standard test markets

New products are tested in a situation similar to a full-scale launch. Several cities are normally chosen to serve as test sites. It is important that these sites reflect market conditions similar to those in the new product's projected market area. It should be remembered that the results may differ to a marked extent and demographic differences and other factors should be considered when analysing the test results.

Controlled test markets

This type of test is outsourced to research firms who contract certain controlled panels of stores that have agreed to display new products at a certain fee. The research firms then keep careful track of the sales and also control factors such as shelf location, amount of shelf space, displays and point-of-purchase promotions, including the planned prices.

Simulated test markets

These tests are performed in a simulated shopping environment in which a sample of customers would be invited to take part. They would then be exposed to several promotions and advertisements some of which would relate to the new product being tested. Customers are then given an amount of money to purchase the product of their choice. In doing so, the customers' reactions and intentions to buy may be observed. The type of questions the customers would typically pose could provide some useful information to the firm. This process constitutes a typical trial run and tests the new product's effectiveness against competitors' products. Consumers are normally interviewed to learn what their reasons for purchase or non-purchase may have been. Those who purchased the products are contacted again several weeks later to obtain information about their level of satisfaction.

Product-use tests

A small group of customers are selected to use the product for a limited time. Manufacturers observe these users and learn a great deal regarding servicing requirements and customer training. The views of these people are also sought whether or not they would purchase the product and what the reasons are for their specific choice.

Trade shows

This method tests the reaction of large numbers of people to new products. Especially Japanese firms use trade shows to determine the target price that customers would be willing to pay for a new product.

Distributor and dealer display rooms

New industrial products are displayed next to the firm's existing products as well as those of the competitors. This method helps to establish customers' likely preference and price information in the normal ambience of the sales floor.

Standard or controlled test markets

The business marketer produces a limited supply of the product and the sales force is then given a limited amount of stock to test in a specified number of areas. The new product receives full advertisements, sales promotion and any other marketing support as may be required. In this situation the product and the marketing programme are tested in real marketing conditions. This measures the marketing potential of the product (Kotler, Armstrong, Saunders and Wong, 1996:525-527).

According to Lamb, Hair and MacDaniel (1998:310) it is of the utmost importance to bear the following factors in mind when choosing a test market:

- availability of advertising media which would co-operate
- similarity to planned distribution outlets
- diversified cross section of ages, religions, cultural-societal preferences
- no atypical purchasing habits
- typical per capita income
- good record as a test city, but not overly used
- relative isolation from other cities
- availability of retailers who would co-operate
- availability of research and audit services
- stability of year-round sales

- no dominant television, multiple newspapers, magazines or radio stations
- representative population size

3.2.9 Commercialisation

After the test marketing phase has been completed, the firm would have sufficient information on which to base the ultimate decision whether or not to launch the product. In other words this is the "crunch" time when a firm decides to launch a full-scale marketing offensive. The decision to commercialise the product sets several tasks in motion: ordering raw materials and components; equipment decisions are made; production starts, inventories are built, shipping and distribution channels have to be organised; the new product is announced to the trade and advertised to potential customers (Lamb, Hair MacDaniel, 1998:311-312). It is evident that this is a very costly stage and the relevant finances should clearly be planned with care. According to Kotler, Armstrong, Saunders and Wong, (1996:527-528) the marketers need to make certain decisions in this phase, such as:

- whether the time is right to introduce the product, because a product may be introduced too early or too late
- the decision as to whether the product should be launched in a single location or region, nationally or internationally
- who the target group should be
- an action plan for the introduction of the new product.

3.3 THE UNCONVENTIONAL PRODUCT DEVELOPMENT PROCESSES

3.3.1 Concurrent development process

The new product development processes which have been described above, are commonly known as the conventional processes for the development of new products. They are termed "conventional," because they follow a very structured and rigid process where the next step depends on completion of the previous step in the process. Unconventional processes do not share the confined boundaries and stages of the conventional processes. Companies in Japan pioneered a more holistic and concurrent process for new product development. Tackeuchi and Nonaka (1986) relates this method to playing “rugby,” where the project gets passed within the team as the ball would be in a rugby match, whilst all the players move as a unit on the field.

This "rugby" approach has six characteristics: built-in instability, self-organising project teams, overlapping development phases, "multi-learning", subtle control and organisational transfer of learning. These characteristics form a fast and flexible new product development process, which operates in a much more effective manner than the old traditional sequential process. A brief description now follows of the six characteristics to clarify how this process functions:

Built-in instability: Top management indicates a general strategic direction, but sets rather challenging goals for the project team to attain. Thus, although they do have a great deal of latitude, a certain degree of tension is created to ensure that the team remains as productive and creative as possible.

Self-organising project teams: The project team operates as a new separate firm where initiatives and risks are taken. In order to qualify as a self-organising project team, it should have autonomy, self-transcendence and cross-fertilisation.

Overlapping development phases: Under the "rugby" approach the development phases overlap and this enables the team to absorb the vibration or "noise" generated through the development process. Integration and exchange of information are constant factors in this process.

Multi-learning: The nature of the composition of the project team, leads to multi-learning taking place across multiple levels, including the development of multiple functions.

Subtle control: Although there is a tolerance for mistakes, these groups are controlled in such a manner as to ensure that the team remains productive, though without hampering its level of creativity.

Transfer of learning: The objective is to accumulate knowledge and then to disseminate this across all functions and levels. Knowledge is transmitted in the organisation by converting project activities to standard practice.

Although this method represents a great improvement of the sequential process, Tackeuchi and Nonaka (1986:137) list some limitations of this type of process, namely that it:

- requires extraordinary effort from all team members

- may not apply to organisations where product development is masterminded by an innovator who makes the invention and hands it down for other people below to implement
- may not apply to certain projects, such as breakthrough projects, which require a revolutionary innovation
- may not apply to mammoth projects, where project scale limits extensive face-to-face discussions

Quite a number of adjustments need to be made to implement this new approach successfully. These include:

- general strategy and direction should be given to create an atmosphere of freedom which in turn stimulates intrapreneurial spirit
- challenging goals should be set to create the correct degree of tension
- a different mission should be assigned to new product development
- tolerate and even encourage trial and error
- top management support
- employees should be well informed regarding this new manner of doing things

Concurrent processes include processes such as simultaneous marketing and simultaneous engineering; the aim of the latter being to produce better products at lower cost and shorter lead times from the conception of the idea to the customer. This is achieved through parallel and integrated engineering activities. Simultaneous marketing on the other hand, is a concept of parallel and integrated activities related to market knowledge, marketing, services and distribution of products. The goal of simultaneous marketing is to contribute to the development of innovative products and product concepts, to support decision and development processes on all levels, to facilitate and perform marketing tasks, and to decrease the time to market (Barius, 1994:145,148).

Several studies have been undertaken in respect of new product development processes in Japan. Kodama (1995:2) conducted one such study and he argued that the most important capacity of the new product development process was the capability to convert demand from a vague set of distant wants into well-defined products. This is called demand articulation. This entails a two-

step process, namely the translation and integration of market data into a product concept and the decomposition of the product concept into development projects. Japanese firms set three prerequisites for this process. Firstly, top management should have a long-term commitment towards the new product development process. Secondly, the firm should realise that it is in an intense inter-firm competition which motivates it to focus on customers' needs and innovate in a creative fashion. Lastly, the industry within which the firm is operating, has a large degree of technological competence and, therefore, absorbs technologies from other industries more easily.

Some of the reasons for new product successes in Japanese firms are as follows (Song and Parry, 1997:2):

- Japanese firms have self-organising supplier networks which are characterised by a shared division of labour, learning, information exchange as well as reciprocity
- Top management provides strategic vision and subtle control
- The existence of self-organising project teams
- Overlapping of product development phases
- Cross-functional learning and organisational transfer of learning take place

The above mentioned factors result in speed and flexibility which are – as mentioned elsewhere – the order winners of the present day industry.

3.3.2 Target costing

Target costing is not a type of new product development process, but it rather acts as a driver of a product development strategy which enables the design team to focus on the ultimate customer and on the real opportunities in the market. This is a structured approach to determine the cost at which a proposed product, with a specified functionality and quality, should be produced to generate the desired level of profitability at its anticipated selling price (Cooper and Slagmulder, 1996). Target costing is a way of thinking and acting which has a direct influence on the new product development process.

A brief description now follows of how Nissan approaches target costing. In this target costing system, a target selling price for each new model is established; then a target margin is determined based upon corporate profitability objectives and, lastly, the model's target cost is

identified as the difference between the target selling price and the target margin. Value engineering is now applied to ensure that the new model could be manufactured at this target cost. This entails the decomposing of components and the analysis of the market to enable the production of the product at the target cost.

The production process is divided into three distinct stages:

1) The conceptual design stage: In this stage projects are initiated to introduce new product models. Consumer analysis identifies the mixture of models that Nissan expects to sell. Then a lifetime contribution study is done to compare the estimated revenues generated by each new model to the expected cost of the product throughout its life. This adds up to the direct material marginal profit. From the above several sets of expenses are then subtracted:

- direct manufacturing and sales expenses
- direct labour costs
- depreciation charges for machining, casting and other production steps
- research and development expenses

The result is the life cycle contribution of the particular model under development. The life cycle contribution is then evaluated to establish whether the new product would be a viable option for the company to produce. It is evident that value engineering and the identification of a target price constitutes an interactive process. When the allowable costs are considered to be too far below the estimated cost, the appropriate price range and functionality are reviewed until the allowable cost which was initially considered achievable is identified. Hereafter a major review of the model is conducted by performing both a profitability study and an analysis of its performance characteristics and, provided these results are satisfactory, the model then enters the next stage of development.

2) The product development stage: In this stage new products are prepared for production. An order sheet is drawn up which lists all the components of the new model. This is mainly done to determine which components would be sourced internally vs. externally. Suppliers receive a description of the components and are requested in turn to provide price and delivery timing estimates. Value engineering is used to determine allowable costs for each component. Cost reduction objectives are attained by disassembling and analysing competitor's products; by

implementing incentive programmes in order to motivate suppliers to provide cost reduction ideas; by increasing the commonality of parts across variations and models and by reducing the number of components to be used. Two or three prototypes of these new models containing the new components are produced and tested. As the models enter production, the accounting department will monitor all manufacturing and assembling costs. Whenever these costs should not be in line with the target costs, value engineering is applied once again until the target cost is eventually met.

3) The production stage: A product is only passed on to this stage if it proves to be possible to produce the model at the estimated target cost.

It is evident that the target costing system influences the new product development process to a very large extent. It ensures that the firm does not produce products which could lead to losses because they are produced at too high a cost or sold at too high a price.

3.4 CROSS FUNCTIONAL TEAMS

Since both conventional and concurrent methods of new product development use cross-functional teams, it would now be appropriate to discuss this matter briefly. Some companies refer to these teams as result teams or multi-disciplinary teams. The term to be used here will be "cross-functional teams."

When the outcome of a feasibility study on a new product or service is successful, management would normally present this new idea to the whole firm. Volunteers from all the different functions are then chosen and a cross-functional team is formed. The person responsible for the new idea is normally either included in the team or could even be appointed as the team leader. This team leader is often called the product-champion and his/her power and influence is equal to, or greater than that of the heads of functional departments. The product champion is important in achieving the overall integrity of the product through the effective integration of the various functional members. This person ensures that the project's goals are achieved. Some studies emphasise the key role this person plays in carrying innovation from the research laboratory to the market. Innovations need effective leadership to overcome the resistance of organisations to relinquish the stability of the status quo. SAPPHO project's comparative analysis of 43 pairs of successful and unsuccessful innovations is only one of the numerous studies which established that the product champion plays a major role in the success of the new

product or service (Grant, 1995:284). Most companies follow step-wise new product development processes. Some companies even choose a leader for every new phase of the process. This certainly has both its advantages and disadvantages. It may be logical to appoint for example the marketing person as team leader when the process is in its launching phase, since this person is a specialist in his/her field and should be able to guide the team in the right direction. The changing of the leadership could, however, lead to a situation where no one would take full responsibility and consequently it becomes difficult to pinpoint what person should have taken it. A decision to change the team's leadership should thus be made with due consideration to the specific situation.

The main reason for forming such cross-functional teams is that the functional separation of those persons involved in the process often leads to the loss of a great deal of synergy. When co-operating as a team on a project, all members are able to gain insight into all the aspects of the various functions to be considered in producing a new product.

Cross-functional teams normally work independently from the parent organisation. Some companies even create a parallel organisation structure linked to the existing one. It is of the utmost importance that these teams are given the necessary autonomy to enable them to come to the correct decisions. Because these members are drawn from different functions, the complete team should possess the necessary know-how and skills to solve any problems.

There should be continuity in the team membership to ensure the continuity of knowledge, skill and commitment to the very end of the project. There may be a shortage of skilled personnel and the firm may thus withdraw certain members before the completion of the project. This should obviously be avoided as far as possible because such actions tend to have negative implications for team members' commitment to the project.

Some companies, for example property developers, even include outsiders – such as customers and suppliers – in their cross-functional teams. Although this is not a widespread practice, it could nevertheless be beneficial to an organisation.

3.5 SUMMARY

In this chapter both the conventional and the unconventional new product development processes were discussed. The conventional new product development process follows a very structured and rigid process where the next step depends on completion of the previous step in the process. The

steps used vary from company to company but the following are a typical set of steps that may be followed: organisation for development, development of ideas, screening of ideas, concept development, profitability analysis, physical product development, test marketing and commercialisation. The unconventional new product development processes do not have the confined boundaries and stages of the conventional processes. The following are the characteristics of an unconventional new development process: built-in instability, self organising project teams, overlapping development phases, multi-learning, subtle control and transfer of learning. Target costing – a method of development used by the Japanese – was then discussed. Target costing ensures that the development team would introduce profitable products to the market with the right level of quality and functionality at the appropriate prices for the targeted customers. Organisations which employ this method normally focus on the needs of customers and their willingness to pay, instead of following the flawed, but common practice of cost-plus pricing. Finally, cross functional teams and their specific involvement in new product development were analysed. Although cross functional teams may be a very useful tool to organisations, the management of such teams may become complex.

CHAPTER 4

THE PHARMACEUTICAL INDUSTRY AND NEW PRODUCT DEVELOPMENT ACTIVITIES UNIQUE TO THE INDUSTRY

4.1 INTRODUCTION

In this chapter the unique features of the pharmaceutical industry will be discussed, as well as the reasons why new product development in this industry differs from other industries. An overview of the manner new product development takes place will then be provided. The regulation of new product development in the pharmaceutical industry will be described, including the diffusion of innovation in the pharmaceutical industry. The ways and reasons why customer acceptance of the products differ from other industries will be covered and a discussion will then follow on the international pharmaceutical industry and the top ten pharmaceutical companies in the world. Finally, an overview of the South African pharmaceutical industry will be given.

4.2 UNIQUE CHARACTERISTICS OF THE PHARMACEUTICAL INDUSTRY REGARDING NEW PRODUCT DEVELOPMENT

The world wide pharmaceutical industry is unique in that it spends more than five times more (19.4% of sales) than the average of all industries (3.8%) on research and development (Ruijten, 1997:58-61). The estimated cost of research and development in 1999 was US$ 49 billion, with 37% of the funds allocated to research and 63% to the development of new products. It is said that US$ 1 billion spent annually by a pharmaceutical company is barely sufficient to manage a competitive pipeline (Eugel, 1999).

4.3 WHY NEW PRODUCT DEVELOPMENT IS DIFFERENT IN THE PHARMACEUTICAL INDUSTRY

Drug development in the pharmaceutical industry depends on the discovery of new clinical entities, and more than a third of organisations' financed research and development is devoted to the evaluation of promising chemical compounds in human clinical trials. The total cost to bring

a new chemical entity to market is approximately US$ 350m and takes on average some 8.4 years.

4.4 NEW PRODUCT DEVELOPMENT PARTICULAR TO THE PHARMACEUTICAL INDUSTRY

In the past the fundamental tasks facing the pharmaceutical industry remained quite consistent:

1) Identify targets for drug intervention

2) Create/discover novel compounds

3) Screen the target against the compound to identify substances that may be effective drugs.

These typical three steps used to be laborious and time-consuming. This is evident when the experience of MSD, a leading firm in respect of new product development, is considered. MSD is a firm that has a product development cycle of 7 to 12 years, which is normal in this industry (Crawford, 1991:408). New product development in the pharmaceutical industry is traditionally a staged process that involves the stages set out in Table 4.1.

TABLE 4.1
THE TYPICAL NEW PRODUCT DEVELOPMENT PROCESS IN THE PHARMACEUTICAL INDUSTRY

Pre-clinical studies	Step 1:	Screening for new clinical entities
Pre-clinical studies	Step 2:	Discovering of new chemical entities
Pre-clinical studies	Step 3:	Animal pharmacology: toxicity and reproductivity
Pre-clinical studies	Step 4:	Toxicity studies: embryo-foetal & peri-natal; Muta-genicity & carcinogenicity
Pre-clinical studies	Step 5:	Chemical, pharmaceutical & biological testing
Clinical studies	Step 6:	Phase I: Bio-availability: healthy volunteers
Clinical studies	Step 7:	Phase II: Dose ranging – patents
Clinical studies	Step 8:	Phase III: Safety and efficacy
Clinical studies	Step 9:	LAUNCH

Source: GCP, 1997:44

It would appear as if new drug development was guided more by intuition and accumulated experience than by scientific tools. The following illustrate this point:

- Successful scientists may identify one or two targets during a lifetime of research. At the end of 1995 the pharmaceutical industry as a whole had identified only about 500 targets of drug intervention in the history of pharmaceutical discovery.

- Because even the most advanced technology was relatively unsophisticated, having top-notch in-house chemists was the key determinant of success.

- Animal models and tissue arrays were not amenable to automation, and these limited information with regard to new clinical entities.

This meant that discoveries were rare and expensive and in turn constituted the principal bottleneck in the pharmaceutical value chain. Traditionally an average firm may hope to discover roughly 12 new clinical entities per annum, of which 75% would have failed in the pre-clinical and Phase I of development because of a lack of safety or efficacy, poor bio-availability or other reasons. In the later phases the success rate would increase to one or two drugs which reached the marketplace. Following the Thalidomide tragedy in the 1960s, drug development and availability to the consumer became a long and tedious process. High-throughput screening has, however, fundamentally altered the science and economics of drug discovery. The combination of these technologies is likely to make the discovery of new clinical entities not only more predictable, but profitable (Goldsbrough, Lawyer and Sondhi, 1998).

4.5 REGULATION OF PRODUCT DEVELOPMENT IN THE PHARMACEUTICAL INDUSTRY

The development and availability of drugs are highly regulated by governments internationally. The purpose of such regulations is to protect subjects against the possible harmful effects of drugs and to maintain high ethical, scientific and professional standards in the new product development process.

The Federal Drug Administration (FDA) in the United States of America is certainly the most well known drug regulatory authority in the world. The related body in the United Kingdom is the Medicines Control Authority (MCA). Virtually every other country in the world has its own regulatory body. In South Africa, the Medicines Control Council (MCC) is the regulatory authority. The new SA Medicines and Medical Device Regulatory Authority Act 132 of 1997 will in future regulate the registration of all compounds for which medicinal claims are made in South Africa. Section 25 of this Act prohibits the sale of medicines which do not comply with

the prescribed requirements. It also stipulates the information regarding medicines that should be furnished to the authority. All medicines and medical devices are to be evaluated by the MCC by means of a well-defined registration procedure, with time frames and fees attached thereto. The application is screened to ensure that it is in the prescribed format and contains the required information. Failure to meet these standards would result in the applicant being notified in writing of the reason why the MCC is not satisfied (Beaumont, 1999). Provision is also made in the Medicines and Related Substances Control Act for the MCC to authorise the use of an unregistered medicine or medical devices for certain purposes. This is reflected under Section 30 of the Act. When new products are being developed, companies have to apply for permission to conduct clinical trials, as such products have not yet been registered. The following documents must be submitted (Medicines and Related Substances Control Act, Act 101, 1965):

1) Clinical trial application form

2) The research protocol

3) Investigator's brochure, with all the data on the new product available to date

4) A Curriculum Vitae for each participating investigator

5) A signed declaration of each trialist

6) A written copy of the Ethics Committee Approval

This application is then evaluated by the Clinical Trial Committee of the MCC and submitted to the Board of the MCC for approval. An applicant may also apply for approval to import an unregistered drug, which could then be researched in the product development process.

4.6 DIFFUSION OF INNOVATION IN THE PHARMACEUTICAL INDUSTRY

The process by which an innovation develops from its inception to its actual use by customers is termed "diffusion." Four crucial elements are identified in the diffusion process (Hisrich and Peters, 1984):

1) The innovation

2) The communication from one individual to another

3) The relevant social system of which these individuals are part

4) The time dimensions in the process

4.6.1 Innovation in the pharmaceutical industry

Innovations in combinatorial chemistry, high throughput screening and pharmaco-genomics (the use of knowledge of individuals' genetic composition to tailor drugs to particular sub-populations of patients, significantly enhancing safety and efficacy within those sub-populations) have certainly transformed the early stages of the research and development process in the pharmaceutical industry. Over the past few years these have delivered a ten-fold increase in the number of compounds that could be generated for assays, and a 100-fold increase in the number of compounds that could be screened. These tools have become even more important in the context of the new treatment areas now emerging as a result of human genome technology which creates more targets for therapeutic intervention.

Innovation in the pharmaceutical industry can thus increase the number of new products or therapies in three different ways:

1) Technological innovations which enhance the screening of new clinical entities.

2) Pharmaco-genomics which increase the number of targets on which existing, or new compounds may act.

3) Innovations in understanding disease processes as a result of which more targeted drugs become available.

The emergence of so-called lifestyle drugs, such as Viagra, led to the emergence of a new category of drugs which is specifically directed towards the end consumer and has changed behavioural patterns significantly in the health care industry.

4.6.2 Communication

Because of the staged nature of new product development in the pharmaceutical industry, cross-functional teams would normally only be created late in the development process. These teams are usually formed after the completion of the drug development when companies await the

registration of the product. This process may last from 8 months to 3 years in different countries. The flow of information is usually slow and inadequate, mostly because of fear that the drug may fail or indicate some toxicity problems which may be totally unforeseen. According to Moenart and Sunder (1990:213-219), there are four key elements which influence the utility of inter-functional information:

1) Relevance: the extent to which the information is perceived to be appropriate to the task.

2) Novelty: a measure of the number of new arguments in the information.

3) Credibility: the degree to which the receiver believes the information to be free of distortion.

4) Comprehensibility: a measure of the ease with which the receiver could unambiguously understand the information. Those companies that are able to optimise information utility, would gain a competitive advantage because of fewer and less costly mid-course corrections throughout the drug development process (Lynch, 1997:27-28).

4.6.3 The social system

In the pharmaceutical industry this system consists of a large number of persons, starting with the researchers or discoverers, pharmaceutical developers, toxicologists, pharmacologists, kineticists, clinicians and others too many to mention. This implies that these numbers are too many to involve in a cross-functional team. For this reason the development teams normally consist of a clinician who would have been involved in the pre-clinical and clinical development, a product or brand manager, a market researcher, project accountant and representatives from outside advertising and communication companies.

4.6.4 The time dimension

With the end consumer not always being the primary focus in health care, the pharmaceutical industry primarily targets the prescriber, be it the physician, pharmacist or nurse. Direct sales via representatives still form the backbone of communication with the physician. Technical detail aids are developed as aids in the selling process, as are research meetings, congresses and exhibitions. The relevant time dimension is usually relatively short because of the high level of education and training of the employees in the pharmaceutical industry and the professions.

4.7 CUSTOMER ACCEPTANCE

The consumer's experience of the pharmaceutical industry is radically different compared to other industries. In most product categories, manufacturers build relationships with all the players in the distribution chain. They focus actively on their end-users, providing consumers with a wealth of information customised to meet their product and image needs and offering additional decision and service support. The products are often customised, or at a minimum offered in a range of designs, strengths and sizes to meet individual needs (Goldsbrough, Lawyer and Sondhi, 1999:30). Historically the pharmaceutical industry only dealt with the treatment of diseases which were defined broadly. Health care focused on diseases, not individuals, and payers and providers set treatment approaches relevant to each disease. Consumers lacked the knowledge to participate as equals in health care decisions and pharmaceutical companies focused sales and marketing efforts on payers and providers, whom they viewed as the key decision-makers as regards therapy and brand. The Pharmaceutical Executive (Gopal 1997:34) recently published the results of a patient-information survey which The Patients' Network conducted among patients, patient-group leaders, and health care professionals. One of the questions asked of patients was whether they were receiving too much, sufficient, or too little information in five categories - treatment alternatives, risks of treatment, benefits of treatment, effect of no treatment, effect of treatment on quality of life. The patients overall responded that they were receiving too little information on all areas, particularly on treatment alternatives, effect of treatment on quality of life, and managing illnesses through lifestyle changes. It was noted that the mere transmission of information did not necessarily constitute good patient education, and thus it was suggested that the way information was communicated should be investigated.

Because of the nature of new product development in the pharmaceutical industry, consumer acceptance was virtually never evaluated. In some instances, like the reformulation of over-the-counter (OTC) products, customers or potential patients were used to evaluate taste, compliance (whether the patients took their medication as prescribed), preferences (for different formulations, for example banana or raspberry flavour) and comparative (active compared to placebo) products. The industry made some attempts to obtain customers' more active involvement, but it turned out not to be not an easy operation and not all who were involved were positive about this experience.

Nancy Mattison, the executive of Pharmaceutical Partners for Better Healthcare, states that many patient-group leaders find the regulatory barriers to direct communication with the pharmaceutical industry frustrating, such as the advertising directive which prohibits many forms of communication which in turn causes an excessive emphasis on risks (1997). A poll amongst pharmaceutical executives suggests a continued wariness outside the industry to direct-to-customer advertising as a means of redressing such imbalances. Marianne Rigg, Director of the London based information and research charity, College of Health, states that the public need to perceive information as unbiased and non-promotional. She continued that direct-to-customer advertising may not be all that helpful, because patients could not be expected to ask sophisticated questions about the advertising material, such as whether or not it had been peer-reviewed (Gopal, 1997:34).

However, now for the first time in history, the person with the greatest influence on the sale of a drug may soon be the person who consumes it. There is an increasing pressure on pharmaceutical companies to address consumer needs. Two forces are initiating a consumer revolution in health care which would cause the consumers to move from the periphery to the centre. Firstly, as consumers become increasingly better informed, they establish greater control over decisions regarding their health and medical care. Patients visit their physicians armed with sophisticated information, questions and preferences based on Internet-enabled research. Secondly, there is an accelerating progress in genetic understanding which would enable companies to segment patients on the basis of pharmaco-genomic (the use of knowledge of individuals' genetic composition to tailor drugs to particular sub-populations of patients, significantly enhancing safety and efficacy within those sub-populations) description and to tailor therapy to their specific needs. Tailored treatment protocols are becoming available, and consumers become more active in shaping their own healthcare. Recent developments in breast cancer provide a powerful early example of this change. The association of the BRCA1 and BRCA2 codes for two identified genes associated with the risk for breast cancer, unleashed a surge of demand among women for diagnostic tools, information, and decision support and prophylactic treatment. It is evident that the pharmaceutical companies that do not focus on the needs of their end-consumers will be losing a great deal of lucrative business (Goldsbrough, Lawyer and Sondhi, 1999:29).

4.8 THE INTERNATIONAL PHARMACEUTICAL INDUSTRY

4.8.1 Current trends and new developments

The pharmaceutical industry has seen some significant changes over the last few years. The most significant is the period of "merger-fever", e.g. Glaxo-Wellcome, Astra/Zeneca and Hoechst Marion Roussel, and several more. The merging of companies presupposes several implications. On the one hand it is normally done to broaden the horizons as to new products, growth in sales, know-how, etc. On the other hand it may cause many in-house problems for two or sometimes three companies to become accustomed to the new way of doing things. Another significant new trend is the tendency to develop and produce lifestyle drugs, such as anti-impotence drugs (Viagra from Pfizer), anti-obesity drugs (Meridia from Knoll) and male pattern baldness therapies (Propecia from MSD).

The World Health Organisation (WHO), in co-operation with the private sector and specifically the pharmaceutical industry, has also undertaken a number of worthwhile projects. These included the "Roll back Malaria" programme, Children's Vaccine Initiatives, HIV/AIDS and Tuberculosis fund raising initiatives, and also the establishment of certain work groups (ICH) to address specific health problems. The WHO, National Health Society (UK), as well as the first randomised controlled clinical trial conducted in the pharmaceutical industry (McAdam, 1999) have already celebrated their 50^{th} anniversaries.

4.8.2 World pharmaceutical sales

In 1997 the sales of the pharmaceutical industry's ten leading markets increased by 6% to US$ 165.5 billion according to the International Marketing Services' Drug Monitor (Barker, 1999:39). When sales for 1998 are considered, the data reflect a slight decrease in growth of sales of 5% (see Tables 4.2 & 4.3).

TABLE 4.2
TOTAL PHARMACEUTICAL SALES IN TEN LEADING MARKETS: 1997

COUNTRY	1997 TOTAL GNP (Atlas method; US$bill)	1997 SALES (US$bill)	%CHANGE IN SALES FROM 1996
USA	7,690	66,5	+10
JAPAN	4,772	41,7	- 1
GERMANY	2,319	14,7	+2
FRANCE	1,526	13.7	+4
ITALY	1,055	8,6	+5
UK	1,220	7,7	+7
SPAIN	570	4,9	+10
CANADA	584	4,1	+12
NETHERLANDS	403	1,9	+7
BELGIUM	270	1,8	+5
TOTAL	**204,409**	**165,5**	**+6**

Source: Darbourne, 1999:30 and http//www.cdinet.com/DEC/wdi98/new/databytopic/gnp.pdf

TABLE 4.3
SALES IN NORTH AMERICA, LEADING EUROPEAN MARKETS, JAPAN, LEADING LATIN AMERICAN MARKETS AND AUSTRALIA/NEW ZEALAND IN 1998

COUNTRY	**YEAR TO SEPT 1998 (US$mill)**	**% CHANGE**
NORTH AMERICA	76,486	+10
USA	72,234	+9
CANADA	4,252	+13
EUROPE (TOP 5)	50,907	+6
GERMANY	14,932	+6
FRANCE	13,888	+5
ITALY	8,782	+7
UK	8,226	+8
SPAIN	5,079	+11
JAPAN	37,622	- 3
LATIN AMERICA (TOP 3)	13,331	+4
BRAZIL	6,595	- 2
ARGENTINA	3,503	+7
MEXICO	3,233	+17
AUSTRALIA/NEW ZEALAND	2,465	+ 8
TOTAL (selected world)	**180,811**	**+ 5**

Source: Darbourne, 1999:29

In terms of sales, it is imperative to establish which of the therapeutic classes is selling best. This depends on how much money was spent in the therapeutic classes, based on the disease patterns which were studied, in order to ascertain the most lucrative potential. In Table 4.4 a summary is

provided of the best sellers of 1998, according to figures from International Marketing Service's international pharmaceutical audit. The sub-class revenues for Viagra, Pfizer's controversial product for erectic dysfunction, propelled to a 277% increase in growth in 1998 which constituted sales of US$ 0.7 billion. It ranked 79th overall. Another high-performing subclass was angiotensin II antagonists used for hypertension, which registered a growth of 104 % of sales, i.e. US$ 1.1 billion (Peterson, 1999).

TABLE 4.4
SUMMARY OF BEST-SELLING DRUGS IN 1998

DRUG	US$ SALES GENERATED (BILLION)	PERCENTAGE OF THE TOTAL MARKET
ANTI-ULCERANTS	12,9	5,1
ANTI-DEPRESSANTS	9,4	3,8
TRIGLYCERIDE & CHOLESTROL LOWERING DRUGS	9,6	3,7
CALCIUM ANTAGONISTS	8,7	3,4
CEPHALOSPORINS & COMBINATIONS	6,8	2,7
ACE INHIBITORS	6,5	2,7
NON-NARCOTIC ANALGESICS	6,2	2,5
ANTI-RHEUMATIC NONSTEROIDS (NSAID)	6	2,4
ANTI-PSYCHOTICS	3,9	1,6
BROAD SPECTRUM ANTIBIOTICS	3,8	1,5

Source: Peterson, 1999:48

4.9 THE TOP TEN PHARMACEUTICAL COMPANIES IN THE WORLD

4.9.1 The current situation

Pharmaceutical sales from January 1998 to June 1998 are shown in Table 4.5, together with the percentage growth of sales. MSD is still the number one ranked pharmaceutical company and it delivered US$ 7 billion worth of sales, which added up to 9% growth in sales, if the 50% contribution from the MSD-Astra joint venture (restructured 1 July 1998) is taken into account. Although Glaxo Wellcome was performing better than MSD compared to other companies it showed a drop in sales which could be ascribed to the demise of patents on its anti-ulcer drug, Zantac, as well as its antiviral drug, Zovirax. The above resulted in a decline in sales of 49% and 38% respectively for Zantac and Zovirax. Pfizer is currently the fastest growing pharmaceutical company world wide thanks to the controversial product, Viagra. It registered a 26% growth of sales in 1998 and achieved sales of US$ 400 million after only three months on the market. BM Squibb showed a growth of 14%, which could be attributed to the anticancer drug, Taxol, and the

antidiabetic drug, Glucophage. Novartis experienced a rather bad year because of destocking by US wholesalers. Brazil also reduced the number of products and in Japan there were price cuts. Novartis slid from its third place to fifth. Johnson & Johnson moved up two places to the sixth position mainly based on the strong gains of three products, antipsychotic (Risperdal), the anti-anaemia treatment (Procit), and the transdermal patch for pain (Duragesic). Roche scored the second highest percentage of growth in sales of all companies and rose from 12th to 7th place. An increase of 135% for the schizophrenia drug Zyprexa resulted in a higher ranking for Lily from the previous year to number eight. American Home Products had a rather bad year with the withdrawal of three products, the anti-obesity drugs Redux and Pondimin, and also its non-steroidal anti-inflammatory drug, Duract. American Home Products slipped one place to number nine. Hoechst had generic competition and withdrew its antihistamine (Terfenadine) in major markets.

TABLE 4.5
THE PHARMA SALES OF THE TOP TEN COMPANIES FOR THE PERIOD: JANUARY 1998-JUNE 1998

RANK	COMPANY	PHARMACEUTICAL SALES (US$BILLION)	PERCENTAGE CHANGE FROM PREVIOUS YEAR
1	MSD & Co	7,039	9
2	Glaxo Wellcome	6,377	-6
3	Pfizer	5,499	26
4	BM Squibb	5,404	14
5	Novartis	4,736	1
6	J & J	4,254	10
7	Roche	4,111	24
8	Lilly	3,97	16
9	American Home Products	3,942	6
10	Hoechst	3,808	-2

Source: Barker, 1999:39

It is interesting to note that the pharmaceutical companies that rank best worldwide are not necessarily the most profitable and also do not spend the most on research and development. In Table 4.6 a summary is given of the operating profits as percentage of sales, as well as research and development, as percentage of sales. Glaxo Wellcome, rated second, had the highest operating profits as percentage of sales and Pfizer showed the largest percentage research and development as percentage of sales. From this table it is clear that most of the companies

showed twice (or more) as much operating profit as percentage of sales than research and development as percentage of sales. It is noticeable that MSD listed as number one, showed the smallest research and development as percentage of sales in this table.

TABLE 4.6
OPERATING PROFITS AS PERCENTAGE OF SALES AND RESEARCH AND DEVELOPMENT AS PERCENTAGE OF SALES OF THE TOP TEN COMPANIES

RANK	COMPANY	OPERATING PROFITS AS % OF SALES	RESEARCH AND DEVELOPMENT AS % OF SALES
1	MSD & Co	27.9	11.9
2	Glaxo Wellcome	35.4	14.4
3	Pfizer	31.0	16.0
4	BM Squibb	29.7	NA
5	Novartis	26.7	18.6
6	J & J	34.7	16.7
7	Roche	NA	21.1
8	Lilly	NA	17.3
9	American Home Products	NA	NA
10	Hoechst	NA	17.0

Source: Barker, 1999:39-40

4.9.2 What will the future hold?

International Marketing Services Health (Peterson, 1999:48) estimates that the world pharmaceutical market will grow 7.8% annually to reach a total value of US$ 406 billion in the year 2002. It is said that North American, European, Japanese and the Latin American markets will continue to dominate the market, and it is expected that these markets would yield approximately 85.2% of all global sales. In Table 4.7 the expected growth rates of the different regions are depicted. It is projected that the Japanese and European markets, which are currently ranked as the third and second largest in size, would grow more slowly than other regions. In Japan the growth is expected to depend on the government's ability to stabilise or improve the current economic situation. Sales in Europe may be influenced by price controls in Germany, France and Italy. Although Europe as a region would in all likelihood show a decrease in growth of sales, there should be an increase in sales in both Spain and the United Kingdom. Table 4.8 contains a summary of the therapeutic classes as a percentage of the total market in 2002, and also of the countries which would make the biggest sales contribution to a specific therapeutic class.

TABLE 4.7
THE EXPECTED GROWTH RATES IN SALES IN DIFFERENT REGIONS

REGION	EXPECTED % GROWTH IN SALES
Southeast Asia and China	11
Middle East	10,6
North America	9,8
Australia	9,8
Eastern Europe	8,6
Indian subcontinent	8,6
Latin America	8,4
Caribbean	8,4
Russia	6,7

Source: Peterson, 1999:50

TABLE 4.8
THERAPEUTIC CLASS WITH SIGNIFICANT COUNTRY CONTRIBUTIONS AS PERCENTAGE OF MEDICINE OF TOTAL MARKET BY 2002

CLASS OF MEDICINE	COUNTRIES DEVELOPED	% OF TOTAL MARKET IN 2002
Blood and blood forming products	US, Canada, Belgium, France, Germany, Italy, Spain, UK, Japan and Australia	9,3
Musculo-skeletal products	US, Canada, Belgium, France, Germany, Italy, Spain, UK, Japan and Australia	8,4
Cardiovascular medication	US, Canada, Belgium, France, Germany, Italy, Spain, UK, Japan and Australia	6,1
Anti-infectives	Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea and Thailand	14,9
Cardiovascular medication	Far East: Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea and Thailand	6,7
Systemic anti-infectives	Far East: Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea and Thailand	4,3
Central nervous systems medications	Far East: Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea and Thailand	3,9
Systemic anti-infectives	Latin America: Argentina, Brazil, Chile, Columbia, Mexico, Peru and Venezuela	10,1
Cardiovascular medication	Latin America: Argentina, Brazil, Chile, Columbia, Mexico, Peru and Venezuela	9,4

Source: Peterson, 1999:52

4.10 THE SOUTH AFRICAN PHARMACEUTICAL INDUSTRY

South Africa is currently in competition with global markets for market share, which is a very competitive and difficult environment. The economic pressures are significant because of the Rand/Dollar exchange rate and the knock-on effect of world markets. Companies are presently cutting their marketing budgets, which is manifested by the smaller number of advertisements placed in journals. This is obviously a sign of low business confidence. South Africa is regarded as the gateway to Africa, and has to concentrate on the needs of the whole African continent. The health care system remains grossly underfinanced and is, therefore, unable to meet even the basic health care services consistently and competently (Coovadia, 1999:16-17). New innovative products are needed to address the HIV/AIDS crisis which affects approximately 25% of the African population and is one of the critical issues that should be addressed. The inability of patients to pay for state-of-the-art therapies, because of the high percentage of unemployment in South Africa, will limit the market for newer and more expensive medications. It is thus imperative that pharmaceutical companies produce generic products, in addition to over-the-counter medications for both government and tender markets (McAdam, 1999 and Petersen, 1999:66).

The size of the South African private pharmaceutical market was approximately US$ 1,0 billion in 1998. This resulted from a growth of 15% over 1997 sales of US$ 874 million. The growth was 11% in 1997, 21% in 1996 and 15% in 1995. The accumulated growth over the last 4 years was thus 44%, which is significantly higher than the growth in the global pharmaceutical market. The proprietary (over-the-counter) market constitutes about 4.6% of these sales, and the ethical (prescription) markets the rest. The hospital market or public sector market, which is predominantly a generic drug market, was US$ 112 million in 1996 (latest available official statistics). If one assumes a growth of 20% annually, this segment of the market would amount to approximately US$ 161 million in 1998. This constituted a total drug market of approximately US$ 1.2 billion in 1998, or approximately 0.4% of the total global market, and more than 25% of the total market in Africa (US$ 4,7 billion).

Regarding the ethical market Peterson (1999) reports that the leading therapeutic classes and the percentage each forms of total sales are:

Cardiovascular	13%
Systemic antibiotics	14%
Analgesics	8%
Musculo skeletal	6%
Respiratory	7%
Diabetes	4%
Psycholeptics	4%
Dermatological	4%

If one, however, observes leading therapeutic classes in terms of pack sales, then it becomes clear that the non-narcotic analgesic sub-class is by far the leader, followed by cold preparations and expectorants. This is because only 15% of the total population in South Africa have some medical aid or insurance which would reimburse patients for prescribed drugs. The rest of the population will initially buy over-the-counter preparations at a significantly lower cost, or will be treated by the public health system, which is totally generic. This creates a situation where approximately 80% of drugs by volume are provided at a cost of approximately 20% of the total national drug bill.

TABLE 4.9
RANKING OF THE TOP 15 COMPANIES IN SOUTH AFRICA IN 1998

RANKING	COMPANY	SALES (US$MILLION)
1	ADCOCK INGRAM	143
2	SA DRUGGISTS	80
3	NOVARTIS	56
4	ROCHE	NA
5	GLAXO WELLCOME	NA
6	HOECHST	NA
7	MSD & CO	43,5
8	SHERING PLOUGH	NA
9	WARNER-LAMBERT	NA
10	SMITHKLINE BEECHAM	NA
11	JOHNSON & JOHNSON	NA
12	BOEHRINGER INGELHEIM	NA
13	BAYER	NA
14	RHONE POULENC	NA
15	ELI LILY	20,8

Source: McAdam, 1999

Although all the multinational pharmaceutical companies are present in South Africa, it is the two local companies of Adcock-Ingram and SA Druggists (now taken over by Aspen and MacMed) that are the market leaders. Table 4.9 gives a ranking for the top 15 companies in South Africa for 1998.

The new Labour Act which was promulgated in the year 2000, requires all employers to provide to their employees membership of a medical and or insurance scheme. This will have a significant effect on the total private market in South Africa and a staggering growth is foreseen over the next few years.

On the basis of the latest trends and legislation in South Africa, the country would most likely obtain a much higher share of the global pharmaceutical market, and may play an important role in the decision-making process for new product development for the global pharmaceutical market. This is not only because of its potential growth possibilities, but also because of South Africa's capability in new drug development, and its access to unique and scarce patient populations.

4.11 SUMMARY

In this chapter two important issues were addressed, namely what makes the pharmaceutical industry unique and why new product development is different in the pharmaceutical industry. The pharmaceutical industry is worldwide unique in that it spends more than five times as much (19.4% of sales) in comparison with all industries' average (3.8%) on research and development. New product development in the pharmaceutical sector is rather different than most of the other industries in that it takes on average some 8.4 years for a product development cycle to be completed and more or less US$ 350m to bring a chemical entity to the market.

New product development particular to the pharmaceutical industry, as well as its regulation, was discussed. In South Africa the Medicines Control Council (MCC) is the regulatory authority. The new SA Medicines and Medical Device Regulatory Authority Act 132 of 1997 will in future regulate the registration of all compounds for which medicinal claims are made in South Africa. Section 25 of this Act prohibits the sale of medicines which do not comply with the prescribed requirements. It also stipulates the information regarding medicines that should be furnished to the authority. All medicines and medical devices are to be evaluated by the MCC by means of a well-defined registration procedure, with time frames and fees attached thereto.

The next part gave an overview of the diffusion of innovation in the pharmaceutical industry and the element which were described, included innovation in the pharmaceutical industry, communication, the social system, the time dimension as well as customer acceptance. In the past health care focused on diseases, not individuals, and payers and providers set treatment approaches by disease. Consumers lacked the knowledge to participate as equals in health care decisions and pharmaceutical companies focused sales and marketing efforts on payers and providers, whom they viewed as the key decision-makers on therapy and brand. In general it could be stated that the consumer's experience with the pharmaceutical industry is radically different compared to other industries. In most product categories, manufacturers build relationships with all the players in the distribution chain. They focus actively on their end-users, providing consumers with a wealth of information customised to meet their product and image needs and offering additional decision and service support. The products are often customised, or at a minimum offered in a range of designs, strengths and sizes to meet individual needs. The reverse case is applicable to the pharmaceutical industry.

The international pharmaceutical industry and current trends and new developments, global pharmaceutical companies, and the current and the future situations in respect of the international pharmaceutical industry, were subsequently described.

Finally, the South African pharmaceutical industry was analysed. Because approximately 15% of South Africa's population have medical aid or insurance that reimburse patients for prescribed drugs, it is evident that the rest of the population have to rely on over-the-counter preparations or will be treated by the public health system which is totally generic. In the past this meant that the pharmaceutical industry concentrated largely on generics, but with the advent of the new Labour Act which makes medical aid compulsory as part of employees' compensation, it is bound to have a significant effect on new product development in the South African pharmaceutical industry.

CHAPTER 5

DESIGN AND METHODOLOGY OF THE EMPIRICAL STUDY

5.1 INTRODUCTION

The purpose of this chapter is to explain the design and methodology of the empirical study. The chapter commences with a sample description. Thereafter the measuring instrument which was used will be described, including the response rate achieved. The final section will provide a statistical description of the data that was collected by means of the questionnaires.

5.2 SAMPLE

A list provided in the MIMS Desk Reference Volume 34, 1999, was used to determine the study population. A total of 91 companies appeared on this specific list. After contacting these companies a new list was drawn up. The new list took into account all the mergers that took place during the past few years. The initial number of 91 was reduced to 65 pharmaceutical companies. The structured questionnaire was sent either via e-mail or normal mail to the marketing managers of these companies. Twenty nine of the sixty five pharmaceutical companies returned fully completed questionnaires. A response rate of 44.62% was thus achieved. The annual turnover of the 29 companies represented 69.4% of the pharmaceutical industry's turnover for 1998.

A list of the companies which were approached is given below:

3M Pharmaceuticals SA (Pty) Ltd
Abbott Laboratories South Africa (Pty) Ltd
Adcock-Ingram Critical Care
Adcock-Ingram Pharmaceuticals Limited
Alclin (Pty) Ltd
Alcon Laboratories (South Africa) (Pty) Ltd
Allergan Pharmaceuticals
Alliance Pharmaceuticals Limited
Aspen Healthcare (Pty) Ltd
Bayer (Pty) Ltd

Be-Tabs Pharmaceuticals (Pty) Ltd
Boehringer Ingelheim (Pty) Ltd
Braun Omnimed (Pty) Ltd
Bristol-Myers Squibb (Pty) Ltd
Brunel Laboratories (Pty) Ltd
Byk Madaus (Pty) Ltd
Cipla-Medpro (Pty) Ltd
Columbia Pharmaceuticals (Pty) Ltd
Compu Pharmaceuticals Products Limited
Crown Laboratories Ltd
Donmed Pharmaceuticals
Eli Lilly (SA) (Pty) Ltd
Ferring (Pty) Ltd
Galderma Laboratories SA (Pty) Ltd
Garec Pharmaceuticals (Pty) Ltd
Glaxo Wellcome SA (Pty) Ltd
Hexal Pharma SA (Pty) Ltd
Hoechst Marion Roussel Limited
Janssen-Cilag (Pty) Ltd
Knoll Pharmaceuticals (SA) (Pty) Ltd
Lundbeck South Africa
Mednostica (Pty) Ltd
Medpro Pharmaceutica (Pty) Ltd
Merck Pharmaceuticals (South Africa) (Pty) Ltd
Mirren (Pty) Ltd
MSD (Pty) Ltd
Natal Bioproducts Institute
Norgine (Pty) Ltd
Novartis South Africa (Pty) Ltd
Novo-Nordisk (Pty) Ltd
Opus Pharmaceuticals (Pty) Ltd
Parke-Med (Div of Warner-Lambert SA (Pty) Ltd)
Pfizer Laboratories (Pty) Ltd
Pharmacare
Pharmaceutical Enterprises (Pty) Ltd
Pharmacia & Upjohn (Pty) Ltd
Pharmaplan
R&C Pharmaceuticals (Pty) Ltd
Ranbaxy (SA) Pty Ltd
Rhône-Poulence Rorer
Roche

Roche Products (Pty) Ltd
Schering AG Germany
Schering-Plough (Pty) Ltd
Scientific Pharmaceuticals
Searle (SA) (Pty) Ltd
Servier Laboratories (SA) (Pty) Ltd
Smith & Nephew Pharmaceuticals (Pty) Ltd
SmithKline Beecham Pharmaceuticals
Sanofi-Synthélabo (Pty) Ltd
Triomed (Pty) Ltd
UCB SA (Pty) Ltd
Wyeth SA (Pty) Ltd
Xixia Pharmaceuticals (Pty) Ltd
Zeneca Pharmaceuticals SA (Pty) Ltd

5.3 MEASURING INSTRUMENT

The measuring instrument used for this study was the same one which was designed and used by Calantone, Di Benedetto and Haggblom in 1995. The reason for Calantone, Di Benedetto and Haggblom's research was that they were of the opinion that, although a large number of academic researchers were publishing numerous new product articles, the relevance of the research to product practitioners could be questioned. Another issue questioned the extent to which information known by product researchers was communicated to practitioners. Calantone and Di Benedetto, at a PDMA conference in 1990, suggested that researchers should turn to the practitioner community to identify future research streams with high "leverage value," i.e. topics in respect of which managers needed to have the most and detailed information. The authors compiled new product principles after an integrative literature review of new product development and management.

The questionnaire to companies consisted of the five categories mentioned below. The number of statements that addressed each category is also indicated.

Category	**Statements**
Product innovation	7
New product development and launch	12
Product diffusion	6
Marketing and R&D interface	6
Organisational	9
Total	40

The forty statements and the sources from which Calantone, Di Benedetto and Haggblom (1995) derived the statements are as follows:

PRODUCT INNOVATION

1: Product innovations tend to precede process innovations in my industry.

[Abernathy, W.J. & Utterback, J.M. (1978). Patterns of industrial innovations. Technology Review, 80(3), 2-9; Calantone, R.J., Di Benedetto, C.A. & Meloche, M.S. (1988). Strategies of product and process innovation: a loglinear analysis. R&D Management, 18(1), 13-21; De Bresson, C. & Townsend, J. (1981). Multivariate models for innovation: looking at the Abernathy-Utterback model with other data. Omega, 9(4), 429-436; Utterback, J.M (1981). The dynamics of product and process innovation in industry. In: Technological Innovation for a Dynamic Economy, C.T. Hill & J.M. Utterback (Eds.). New York: Pergamon Press]

2: If market shares are relatively stable and little real product innovation is taking place, the industry is ripe for attack by an invading firm with a radical new product.

[Calantone, R.J., Di Benedetto, C.A. & Meloche, M.S. (1988). Strategies of product and process innovation: a loglinear analysis. R&D Management, 18(1), 13-21; Cooper, A.C. & Schendel, D. (1976). Strategic responses to technological threats. Business Horizons, 19(2), 61-69; Utterback, J.M. (1982). The innovative process: evolution versus revolution. In: The Innovative Process: Evolution Versus Revolution, Proceedings of a Symposium for Senior Executives. Cambridge, MA: M.I.T.]

3: Firms need to be able to handle major changes in technology, as they occur in order to sustain their competitive position over time.

[Calantone, R.J. & Di Benedetto, C. A. (1988). An integrative model of the new product development process: an empirical validation. Journal of Product Innovation Management, 5(3), 201-215; Cooper, R.G. (1980) Product NEWPROD: What makes a new product a winner? Montreal: Centre Quebecois d'Innovation Industrielle; Cooper, R.G. & Kleinschmidt, E.J. (1987). New products: what separates winners form losers? Journal of Product Innovation Management, 4(3), 169-184; Cooper, R.G. & Kleinschmidt, E.J. (1988). Resource allocation in the new product process. Industrial Marketing Management, 7, 249-262; Cooper, R.G. & Kleinschmidt, E.J. (1990). New products: the key factors in success. Chicago IL: American Marketing Association.]

4: Firms need to be able to handle major changes in the marketplace as they occur in order to sustain their competitive position over time.

[Cooper, R.G. (1980) Product NEWPROD: What makes a new product a winner? Montreal: Centre Quebecois d'Innovation Industrielle; Cooper, R.G. & Kleinschmidt, E.J. (1987). New products: what separates winners form losers? Journal of Product Innovation Management, 4(3), 169-184; Cooper, R.G. & Kleinschmidt, E.J. (1988). Resource allocation in the new product process. Industrial Marketing Management, 7, 249-262; Cooper, R.G. & Kleinschmidt, E.J. (1990). New products: the key factors in success. Chicago IL: American Marketing Association.]

5: Firms that pioneer new products have an advantage over later entrants and will end up with a higher market share in the long run.

[Carpenter, G.S. & Nakamoto, K. (1989). Consumer preference formation and pioneering advantage. Journal of Marketing Research, 26(3), 285-298; Cooper, R.G. & Kleinschmidt, E.J. (1993). Major new products: what distinguishes the winners in the chemical industry? Journal of Product Innovation Management, 10(2), 90-111; Haines, D. W., Chandran, R. & Parkhe, A. (1989). Winning by being the first to market....or second? Journal of Consumer Marketing, 6(1), 63-69; Kalish, S. & Lilien, G.L. (1986). A market entry timing model for new technologies. Management Science, 32(2), 194-205; Robinson, W.T. & Fornell, C. (1985). Sources of market pioneer advantages in consumer goods industries. Journal of Marketing Research, 22(4), 305-317; Schnaars, S.P. (1986). When entering growth markets, are pioneers better than poachers? Business Horizons, 29(2), 27-36]

6: Later entrants can do better than pioneers in the long run if there are uncertainties about which technology will eventually dominate the industry.

[Haines, D. W., Chandran, R. & Parkhe, A. (1989). Winning by being the first to market....or second? Journal of Consumer Marketing, 6(1), 63-69; Ali, A. (1994). Pioneering versus incremental innovation: review and research propositions. Journal of Product Innovation Management, 11(1), 46-61 ; Schnaars, S.P. (1986). When entering growth markets, are pioneers better than poachers? Business Horizons, 29(2), 27-36]

7: Later entrants can do better than pioneers in the long run if they have advantages of either lower costs, superior manufacturing techniques, or improved product design.

[Haines, D. W., Chandran, R. & Parkhe, A. (1989). Winning by being the first to market....or second? Journal of Consumer Marketing, 6(1), 63-69; Ali, A. (1994). Pioneering versus incremental innovation: review and research propositions. Journal of Product Innovation Management, 11(1), 46-61; Schnaars, S.P. (1986). When entering growth markets, are pioneers better than poachers? Business Horizons, 29(2), 27-36]

NEW PRODUCT DEVELOPMENT AND LAUNCH

8: A frequent cause of new product failure in the marketplace is a lack of customer orientation in the design process.

[Cooper, R.G. (1980) Product NEWPROD: What makes a new product a winner? Montreal: Centre Quebecois d'Innovation Industrielle; Cooper, R.G. & Kleinschmidt, E.J. (1987). New products: what separates winners form losers? Journal of Product Innovation Management, 4(3), 169-184; Cooper, R.G. & Kleinschmidt, E.J. (1988). Resource allocation in the new product process. Industrial Marketing Management, 7, 249-262; Cooper, R.G. & Kleinschmidt, E.J. (1990). New products: the key factors in success. Chicago IL: American Marketing Association.]

9: A product that has a manufacturing or technological advantage but does not fulfill a need in the marketplace is likely to fail.

[Banting, P.M. (1978). Unsuccessful innovation in the industrial market. Journal of Marketing, 42 (1), 99-100; Cooper, R.G. (1980) Product NEWPROD: What makes a new product a winner? Montreal: Centre Quebecois d'Innovation Industrielle; Cooper, R.G. & Kleinschmidt, E.J. (1987). New products: what separates winners form losers? Journal of Product Innovation Management, 4(3), 169-184; Cooper, R.G. & Kleinschmidt, E.J. (1988). Resource allocation in the new product process. Industrial Marketing Management, 7, 249-262; Cooper, R.G. & Kleinschmidt, E.J. (1990). New products: the key factors in success. Chicago IL: American Marketing Association.]

10: In product categories marked by rigid change, likely future users are the best source of new product ideas.

[Urban, G.L. & von Hippel, E. (1988). Lead user analyses for the development of new industrial products. Management Science, 34, 569-582; Von Hippel, E. (1978). Successful industrial products from customer ideas. Journal of Marketing, 42(1), 39-49; Von Hippel, E. (1995). Lead users: a source of novel product concepts. Management Science, 32(7), 791-805; Von Hippel, E. (1988). The sources of innovation. New York: Oxford University Press]

11: Together, product users and the marketplace form the most important source for new product ideas.

[Urban, G.L. & von Hippel, E. (1988). Lead user analyses for the development of new industrial products. Management Science, 34, 569-582; Von Hippel, E. (1978). Successful industrial products from customer ideas. Journal of Marketing, 42(1), 39-49; Von Hippel, E. (1995). Lead users: a source of novel product concepts. Management Science, 32(7), 791-805; Von Hippel, E. (1988). The sources of innovation. New York: Oxford University Press]

12: Radically new technologies constitute an important source of new product ideas.

[Globe, S., Levy, G.W. & Schwartz, C.M. (1978). Key factors and events in the innovation process. Research Management, 21, 8-15; Hise, R.T., Futrell, C. & Snyder, D. (1980)

University research centers as a new product development resource. Research Management, 23(3), 25-28; Roberts, E.B. & Peters, D.H. (1982). Commercial innovation from university faculty. Research Management, 25(3), 24-30]

13: Any changes in technology constitute an important source of new product ideas.

[Globe, S., Levy, G.W. & Schwartz, C.M. (1978). Key factors and events in the innovation process. Research Management, 21, 8-15; Hise, R.T., Futrell, C. & Snyder, D. (1980) University research centers as a new product development resource. Research Management, 23(3), 25-28; Roberts, E.B. & Peters, D.H. (1982). Commercial innovation from university faculty. Research Management, 25(3), 24-30]

14: Recognition of technological opportunities is essential to product success.

[Globe, S., Levy, G.W. & Schwartz, C.M. (1978). Key factors and events in the innovation process. Research Management, 21, 8-15; Hise, R.T., Futrell, C. & Snyder, D. (1980) University research centers as a new product development resource. Research Management, 23(3), 25-28; Roberts, E.B. & Peters, D.H. (1982). Commercial innovation from university faculty. Research Management, 25(3), 24-30;]

15: Successful products result from the integration of the needs of the market with the technological opportunities available to fulfill those needs.

[Craig, I. (1987). Market pull and technology push I: one company's experience. Information Technology and Public Policy, 5(2), 88-89; Galt, B. (1987). Market pull and technology push II: research and development. Information Technology and Public Policy, 5(2), 90-92]

16: Pretest marketing (e.g. simulated test market) is helpful in reducing the cost of developing and introducing new products.

[Page, A.L. and Rosenbaum, H.F. (1992). Developing an effective concept-testing programme for consumer durables. Journal of Product Innovation Management, 9(4), 267-277; Shocker, A.D. & Hall, W.G. (1986). Pretest-market models: a critical evaluation. Journal of Product Innovation Management, 3(2), 86-107]

17: Product development is less costly in the long run if the firm weeds out questionable products by pretest marketing before full-scale test marketing.

[Page, A.L. and Rosenbaum, H.F. (1992). Developing an effective concept-testing programme for consumer durables. Journal of Product Innovation Management, 9(4), 267-277; Shocker, A.D. & Hall, W.G. (1986). Pretest-market models: a critical evaluation. Journal of Product Innovation Management, 3(2), 86-107]

18: Financial risk assessment should be incorporated into new product project evaluation to fully assess the desirability of a new product.

[Cardozo, R.N. & Smith, D. K. Jr. (1983). Applying financial portfolio theory to product portfolio decisions: an empirical study. Journal of Marketing, 47(2), 110-119; Page, A.L. (1993). Assessing new product development practices and performance: establishing crucial norms. Journal of Product Innovation Management, 10(4), 273-290]

19: Pretest market and test market procedures reduce uncertainties in market share estimates for new products

[Cardozo, R.N. & Smith, D. K. Jr. (1983). Applying financial portfolio theory to product portfolio decisions: an empirical study. Journal of Marketing, 47(2), 110-119; Shocker, A.D. & Hall, W.G. (1986). Pretest-market models: a critical evaluation. Journal of Product Innovation Management, 3(2), 86-107]

PRODUCT DIFFUSION

20: A new product is first adopted by a few innovators who in turn influence others to imitate their behaviour.

[Bass, F. (1969). A new product growth model for consumer durables. Management Science, 15(1), 215-227; Heeler, R.M. and Hustad, T.P. (1980). Problems in predicting new product growth for

consumer durables. Management Science, 26(10), 1007-1020; Norton, J.A. & Bass, F.M. (1987). A diffusion theory model of adoption and substitution for successive generations of high-technology products. Management Science, 33(9), 1069-1086; Srinivasan, V. & Mason, C.H. (1986). Nonlinear least squares estimations of new product diffusion models. Marketing Science, 5(2), 169-178]

21: The new product adoption process can be described as slow initial growth, followed by rapid growth, and finally slower growth as market sales approach potential.

[Bass, F. (1969). A new product growth model for consumer durables. Management Science , 15(1), 215-227]

22: The market potential of a new product remains constant over time.

[Bass, F. (1969). A new product growth model for consumer durables. Management Science , 15(1), 215-227; Mahajan, V., Muller, E. & Bass, F.M. (1990). New product diffusion models in marketing: a review an directions for research. Journal of Marketing, 54(1), 1- 26]

23: Diffusion, or acceptance, of a given product is independent of all other innovations.

[Mahajan, V., Muller, E. & Bass, F.M. (1990). New product diffusion models in marketing: a review an directions for research. Journal of Marketing, 54(1), 1- 26]

24: Advertising for new products is most beneficial in the adoption process at early stages of introduction.

[Horsky, D. and Simon, L.S. (1983). Advertising and the diffusion of new products. Marketing Science, 2(1), 1-17]

25: Advertising levels should be cut back as sales increase and the product progresses through the life-cycle.

[Horsky, D. and Simon, L.S. (1983). Advertising and the diffusion of new products. Marketing Science, 2(1), 1-17]

MARKETING AND R&D INTERFACE

26: Marketing and technical personnel do not communicate effectively with each other.

[Gupta, A. K., Raj S.P & Wilemon, D. (1985). R&D and marketing dialogue in high-tech firms. Industrial Marketing Management, 14, 289-300; Gupta, A. K., Raj S.P & Wilemon, D. (1986). A model for studying R&D-marketing interface in the product innovation process. Journal of Marketing, 50(2), 7-17; Souder, W.E. & Chakrabarti, A.K. (1978). The R&D/marketing interface: results from an empirical study of innovation projects. IEEE Transactions on Engineering Management, 25(4), 88-93; Souder, W.E. & Chakrabarti, A.K. (1980). Managing the coordination of marketing and R&D in the innovation process. In: Management of Research and Innovation, B.V. Dean & J.L. Goldhar (eds.). TIMS studies in management sciences, 15]

27: Marketing and technical personnel generally do not trust each other.

[Gupta, A. K., Raj S.P & Wilemon, D. (1985). R&D and marketing dialogue in high-tech firms. Industrial Marketing Management, 14, 289-300; Gupta, A. K., Raj S.P & Wilemon, D. (1986). A model for studying R&D-marketing interface in the product innovation process. Journal of Marketing, 50(2), 7-17; ; Souder, W.E. & Chakrabarti, A.K. (1978). The R&D/marketing interface: results from an empirical study of innovation projects. IEEE Transactions on Engineering Management, 25(4), 88-93; Souder, W.E. & Chakrabarti, A.K. (1980). Managing the coordination of marketing and R&D in the innovation process. In: Management of Research and Innovation, B.V. Dean & J.L. Goldhar (eds.). TIMS studies in management sciences, 15]

28: Harmonious interaction between marketing and R&D is associated with improved new product success rates.

[Moenart, R. & Souder, W.E., De Meyer, A. & Deschoolmeester, D. (1994). R&D-marketing integration mechanisms, communication flows and innovation success. Journal of Product Innovation Management, 11(1), 31-45; Rochford, L. & Rudelius, W. (1992). How involving more functional areas within a firm affects the new product process. Journal of Product Innovation Management, 9(4), 287-299; Souder, W.E. (1988). Managing relations between R&D and marketing in new product

development. Journal of Product Innovation Management, 5(1), 6-19]

29: Early involvement of both the marketing and R&D departments in the product development process fosters better interaction between the marketing and R&D departments.

[Gupta, A. K., Raj S.P & Wilemon, D. (1985). R&D and marketing dialogue in high-tech firms. Industrial Marketing Management, 14, 289-300; Moenart, R. & Souder, W.E., De Meyer, A. & Deschoolmeester, D. (1994). R&D-marketing integration mechanisms, communication flows and innovation success. Journal of Product Innovation Management, 11(1), 31-45]

30: Support of top management fosters better interaction between the marketing and R&D departments.

[Gupta, A. K., Raj S.P & Wilemon, D. (1985). R&D and marketing dialogue in high-tech firms. Industrial Marketing Management, 14, 289-300]

31: A protocol or formal agreement between marketing and R&D on product performance specifications minimizes conflicts and misunderstandings between marketing and technical personnel.

[Crawford, C.M. (1984). Protocol: new tool for product innovation. Journal of Product Innovation Management , 1(2), 85-91]

ORGANISATIONAL

32: Innovative ideas have a greater chance of eventual new product success when there are fewer participants in the decision system.

[Cooper, R.G. (1994). Third generation new product processes. Journal of Product Innovation Management, 11(1), 3-14; Stefflre, V. (1985). Organisational obstacles to innovation: a formulation of the problem. Journal of Product Innovation Management, 2(1), 3-11]

33: Innovative ideas have a greater chance of eventual new product success when there are fewer opposing factions within the firm.

[Cooper, R.G. (1994). Third generation new product processes. Journal of Product Innovation Management, 11(1), 3-14; Stefflre, V. (1985). Organisational obstacles to innovation: a formulation of the problem. Journal of Product Innovation Management, 2(1), 3-11]

34: Innovative ideas have a greater chance of eventual new product success when decision-making is centralised.

[Stefflre, V. (1985). Organisational obstacles to innovation: a formulation of the problem. Journal of Product Innovation Management, 2(1), 3-11]

35: A key factor that facilitates innovation is the ability to monitor environmental trends.

[Mintzberg, H. (1983). Structure in Fives: Designing Effective Organisations. Englewood Cliffs, NJ: Prentice-Hall]

36: A key factor that facilitates innovation is organisational flexibility.

[Bart, C. (1991). Controlling new products in large diversified firms: a presidential perspective. Journal of Product Innovation Management, 8(1), 4-17; Cordero, R. (1991). Managing time efficiently to avoid product obsolescence: a survey of techniques. Journal of Product Innovation Management, 8(4), 283-295; Johne, F.A. (1984). The organization of high-technology product innovation. European Journal of Marketing, 18(6/7), 55-71; Karagozoglu, N. and Brown, W.B. (1993). Time-based management of the new product development process. Journal of Product Innovation Management, 10(3), 204-215]

37: A key factor that facilitates innovation is the concentration of power in an organisation.

[Luchsinger, V & Bagby, D.R. (1987). Entrepreneurship and intrapreneurship: behaviors, comparisons, and contrast. SAM Advanced Management Journal, 52,10; Pearson, A.E. (1988). Tough-minded ways to get innovative. Harvard Business Review, 66(3), 99-106]

38: Once a choice has been made regarding a strategy for resource allocation, firms do best if they concentrate on making those strategies work rather than trying to change the strategy.

[Romanerle, E. (1987). New venture strategies in the minicomputer industry. California Management Review, 30, 160]

39: It is important for a new product to have a product champion who can offer protection from financial and managerial restraints within the firm.

[Calish, I.G. & Gamache, R.D. (1984). Wizards and champions: the kingdom of new venture management. Journal of Product Innovation Management, 1(4), 238-241; Chakrabarti, A.K. (1974). The role of champion in product innovation. California Management Review, 17(2), 58-62]

40: The success of a new product depends on having the support of the elite powerholders within the organisation.

[Bower, J.L. & Hout, T.M. (1988). Fast-cycle capability for competitive power. Harvard Business Review, 66(6), 110-118; Karagozoglu, N. and Brown, W.B. (1993). Time-based management of the new product development process. Journal of Product Innovation Management, 10(3), 204-215; Lilien, G.L. (1983). If the president likes a new product a model won't kill it. Interfaces, 13(3), 54-58; Rosenau, M.D.Jr. (1989). From experience: schedule emphasis of new product development personnel. Journal of Product Innovation Management, 6(4), 282-288]

For the forty statements referred to above, respondents were asked to evaluate each statement on a five-point Likert-type scale. The Likert scale ranged from "almost always true" to "almost always untrue." Respondents were asked to indicate their view on how true each statement was by placing a cross (x) in the appropriate box.

The last section of the questionnaire also addressed the following characteristics of the organisations included in the study:

- Annual turnover
- Number of different products manufactured and marketed
- Number of people employed
- Number of new products launched during the past five years

The questionnaire used in the study is attached as Appendix 2.

5.4 RESPONSE

Sixty five questionnaires were sent out, of which of twenty nine were returned fully completed, thus achieving a response rate of 44.62%. The industry's total turnover was R5.8795 billion in 1998. The companies that returned the questionnaires represented 69.4% (R4.079 billion) of the total industry turnover. The information collected may thus be deemed representative of the pharmaceutical industry as a whole. A summary of the general statistics of the companies that returned fully completed questionnaires is given in the Table 5.1 below.

TABLE 5.1
SUMMARY OF THE GENERAL STATISTICS OF THE COMPANIES THAT RETURNED FULLY COMPLETED QUESTIONNAIRES

COMPANY NO	ANNUAL TURNOVER (R in millions)	NUMBER OF PRODUCTS MANUFACTURED	NUMBER OF EMPLOYEES	NUMBER OF NEW PRODUCTS LAUNCHED (last 5 years)
1	R 190	53	300	12
2	R 44	6	35	1
3	R 264	170	400	16
4	R 200	40	150	3
5	R 183	50	220	10
6	R 77	18	100	8
7	R 197	18	300	11
8	R 240	600	2600	40
9	R 150	20	150	4
10	R 48	13	52	2
11	R 308	100	800	40
12	R 186	20	100	5
13	R 6	3	12	3
14	R 341	5000	1500	200
15	R 167	40	700	11
16	R 14	7	22	5
17	R 87	75	136	5
18	R 15	9	49	4
19	R 172	73	190	9
20	R 130	50	192	18
21	R 310	90	400	7
22	R 94	1500	2400	40
23	R 45	20	24	2
24	R 39	50	30	5
25	R 50	16	36	4
26	R 32	19	150	7
27	R 92	50	225	10
28	R 57	5	70	2
29	R 341	34	500	11

5.5 STATISTICAL ANALYSIS

Two types of analyses were undertaken. The first type aimed at assessing the marketing practitioners' level of agreement with the principles of new product development as identified by product development academic researchers. The level of agreement with each principle was measured by taking the proportion of respondents who marked 1 or 2 on the five point Likert-type scale. A 1 meant that the respondents found the statement almost always true. This also compared the levels of agreement between the marketing practitioners in the pharmaceutical industry in South Africa and the marketing practitioners in the Calantone, Di Benedetto and Haggblom study.

The second type of analysis attended to the calculation of the median and modal values of the responses to the forty statements and also the identification of possible relationships between organisation variables and new product development activities.

5.6 SUMMARY

The initial number of 91 pharmaceutical companies as listed in the MIMS (1999) were reduced to 65 pharmaceutical companies after taking mergers into account, and the remainder constituted the population under scrutiny in this study. Twenty nine of the sixty five pharmaceutical companies returned fully completed questionnaires, and a response rate of 44.62% was thus achieved. The annual turnover of these 29 companies represented 69.4% of the pharmaceutical industry's turnover for 1998 and it may thus be said that their opinions are largely representative of the opinions of the South African pharmaceutical industry.

The measuring instrument used for this study was the same one which was designed and used by Calantone, Di Benedetto and Haggblom in 1995. The questionnaire consisted of five categories, each with a number of statements (forty in total), i.e. product innovation (7), new product development and launch (12), product diffusion (6), marketing and research (6) and development interface, organisational (9).

CHAPTER 6
RESULTS OF THE EMPIRICAL STUDY

6.1 INTRODUCTION

This chapter will deal with the statistical analysis of the study. The first section will provide an assessment of the marketing practitioners' perceptions with regard to the forty statements. The second section will compare these perceptions with the results of the study done by Calantone, Di Benedetto and Haggblom in 1995. A measurement of the median and modal values will then be given in the third section. In the fourth section a correlation will be drawn between organisational characteristics and new product development activities.

6.2 MARKETING PRACTITIONERS' PERCEPTIONS IN RESPECT OF THE FORTY STATEMENTS RELATED TO NEW PRODUCT DEVELOPMENT

The results of the marketing managers' perceptions with regard to the forty statements on new product development principles are set out in Appendix 3. The level of agreement for each principle was measured by taking the proportion of respondents who marked 1 (found the statements almost always true) or 2 on the five point Likert-type of scale. One (1) and two (2) constitute a high level of agreement that the statement is true. If the respondent marked either four (4) of five (5), he/she agreed that the answer to the statement was usually untrue. The statements and percentage of respondents that are in agreement with a particular statement are set out in Table 6.1.

The first seven statements cover product innovation principles. The results indicate that the organisations agreed highly (gave either one or two as an answer) with the statements one (51.7%), two (89.7%), three (96.6%), four (96.6%), five (82.8%) and seven (62.1%). The lowest agreement in this section related to statement six, as only seven of the twenty nine organisations (24.1%) agreed strongly with the statement. In essence this means that most respondents are of the opinion that later entrants would not do better than pioneers when there are uncertainties regarding which technologies would eventually dominate the industry.

The second section (statements eight to nineteen) deals with new product development and launching principles. The organisations strongly agreed with statements nine (75.9%), eleven

(51.7%), twelve (75.9%), thirteen (58.6%), fourteen (89.7%), fifteen (82.9%), sixteen (69.0%), seventeen (69.0%), eighteen (96.6%) and nineteen (86.2%). Slightly less than half (48.5%) of the respondents were in agreement with statement ten. The lowest agreement corresponded with statement eight. Nine of the twenty nine organisations (31.0%) regarded a lack of customer orientation as a reason for their failure in the marketplace.

The third section (statements twenty to twenty five) addresses production diffusion principles. In this respect there is a relatively high agreement with regard to statements twenty (89.7%), twenty one (65.5%) and twenty four (72.4%). Agreement on statement twenty three was low, namely 6.9%. There was no agreement in respect of statement twenty two, as none of the twenty nine organisations agreed with the statement. Respondents also disagreed with a cutback on advertising as a product progresses through the present life cycle (statement twenty five).

Section four (statements twenty six to thirty one) covers marketing and research and development interface principles. For statement twenty nine there was hundred percent agreement by respondents. All the respondents were thus of the opinion that where the marketing and the research and development departments were both involved at an early stage of a new product's development, the better the interaction between the two departments would be. Respondents strongly agreed with statements twenty eight (96.6%), thirty (96.6%) and thirty one (79.3%). The lowest agreement were for statements twenty six (24.1%) and twenty seven (10.3%). Respondents were thus of the opinion that marketing and technical personnel do not trust each other and do not communicate effectively with each other.

The final section (statements thirty two to forty) covers organisational principles. The results reflect a high agreement with regards to statements thirty three (62.1%), thirty five (75.9%), thirty six (96.6%), thirty eight (65.5%), thirty nine (79.3%) and forty (55.2%). The statements for which there was a low degree of agreement, were thirty two (34.5%), thirty four (20.7%) and thirty seven (10.3%). These clearly indicate that respondents were of the opinion that decentralised decision-making and power, plus the involvement of as many personnel as possible in new product development, facilitated innovation and would give innovative ideas a greater chance of eventual new product success.

6.3 COMPARISON OF THE FINDINGS OF THE CALANTONE, DI BENEDETTO AND HAGGBLOM STUDY AND THIS STUDY

Although the current study is restricted to the pharmaceutical industry in South Africa, it would be a valuable instrument to correlate the responses to the statements in this study compared with those in the Calantone, Di Benedetto and Haggblom study. This would give an indication of how the respondents of this study compared with the thinking and practices in other parts of the world in respect of new product development. A comparison of this nature would also indicate whether the views of personnel in the pharmaceutical industry were significantly different to those of personnel in other industries.

TABLE 6.1
COMPARISON OF THE FINDINGS OF THE CALANTONE, DI BENEDETTO AND HAGGBLOM STUDY AND THIS STUDY

	Percentage agreement with a statement	
Product Innovation Principles	**CDH STUDY**	**CURRENT STUDY**
1. Product innovations tend to precede process innovations in my industry.	65,2	51,7
2. If market shares are relatively stable and little real product innovation is taking place, the industry is ripe for attack by an invading firm with a radical new product.	66,2	89,7
3. Firms need to be able to handle major changes in technology as they occur in order to sustain their competitive position over time.	91,0	96,6
4. Firms need to be able to handle major changes in marketplace as they occur in order to sustain their competitive position over time.	99,3	96,6
5. Firms that pioneer new products have an advantage over later entrants and will end up with a higher market share in the long run.	70,8	82,8
6. Later entrants can do better than pioneers in the long run if there are uncertainties about which technology will eventually dominate the industry.	50,7	24,1
7. Later entrants can do better than pioneers in the long run if they have advantages of lower costs, superior manufacturing techniques, or improved product design.	79,3	62,1

New Product Development and Launch Principles

8. A frequent cause of new product failure in the marketplace is a lack of customer orientation in the design process.	79,2	31,0
9. A product that has a manufacturing or technological advantage but does not fulfill a need in the marketplace is likely to fail.	93,8	75,9
10. In product categories marked by rapid change, likely future users are the best source of new product ideas.	62,6	48,3
11. Together, product users and the marketplace form the most important source for new product ideas.	73,8	51,7
12. Radically new technologies constitute an important source of new product ideas.	39,3	75,9
13. Any changes in technology constitute an important source of new product ideas.	59,7	58,6
14. Recognition of technological opportunities is essential to product success.	74,3	89,7
15. Successful products result from the integration of the needs of the market with the technological opportunities available to fulfill those needs.	97,2	82,8
16. Pretest marketing (e.g. simulated test market) is helpful in reducing the cost of developing and introducing new products.	63,0	69,0
17. Product development is less costly in the long run if the firm weeds out questionable products by pretest marketing before full-scale test marketing.	71,0	69,0
18. Financial risk assessment should be incorporated into new product project evaluation to fully assess the desirability of a new product.	90,3	96,6
19. Pretest market and test market procedures reduce uncertainties in market share estimates for new products.	67,7	86,2

Product Diffusion Principles

20. A new product is first adopted by a few innovators who in turn influence others to imitate their behaviour.	73,4	89,7
21. The new product adoption process can be described as slow initial growth, followed by rapid growth, and finally slower growth as market sales approach potential.	77,2	65,5
22. The market potential of a new product remains constant over time.	0,7	0,0
23. Diffusion, or acceptance, of a given product is independent of all other innovations.	5,3	6,9
24. Advertising for new products is most beneficial in the adoption process at early stages of introduction.	64,2	72,4
25. Advertising levels should be cut back as sales increase and the product progresses through the life-cycle.	30,2	31,0

Marketing Research and Development Interface Principles

26. Marketing and technical personnel do not communicate effectively with each other.	40,0	24,1
27. Marketing and technical personnel generally do not trust each other.	36,8	10,3
28. Harmonious interaction between marketing and R&D is associated with improved new product success rates.	83,1	96,6
29. Early involvement of both the marketing and R&D departments in the product development process fosters better interaction between the marketing and R&D departments.	97,2	100
30. Support of top management fosters better interaction between the marketing and R&D departments.	90,3	96,6
31. A protocol or formal agreement between marketing and R&D on product performance specifications minimizes conflicts and misunderstandings between marketing and technical personnel.	76,9	79,3

Organisational Principles

32. Innovative ideas have a greater chance of eventual new product success when there are fewer participants in the decision system.	62,5	34,5
33. Innovative ideas have a greater chance of eventual new product success when there are fewer opposing factions within the firm.	70,6	62,1
34. Innovative ideas have a greater chance of eventual new product success when decision-making is centralised.	24,6	20,7
35. A key factor that facilitates innovation is the ability to monitor environmental trends.	58,1	75,9
36. A key factor that facilitates innovation is organisational flexibility.	88,0	96,6
37. A key factor that facilitates innovation is the concentration of power in an organisation.	11,9	17,2
38. Once a choice has been made regarding a strategy for resource allocation, firms do best if they concentrate on making those strategies work rather than trying to change the strategy.	70,6	65,5
39. It is important for a new product to have a product champion who can offer protection from financial and managerial restraints within the firm.	92,3	79,3
40. The success of a new product depends on having the support of the elite powerholders within the organisation.	65,3	55,2

The results of the study by Calantone, Di Benedetto and Haggblom (1995) and the results of the current study have a statistical significant correlation (r^2=0.68) and a p value less than 0.001. It was found that for the forty statements the respondents in both studies agreed on thirty seven of the statements. For statements 10 and 32 Calantone, Di Benedetto and Haggblom's respondents showed a high agreement with these statements, whereas a low agreement was recorded for the current study's respondents. As for statement 12, the results indicated that the respondents of the current study strongly agreed with the statement, whilst the other study's respondents recorded a low agreement.

6.4 MEDIAN AND MODAL VALUES OF THE FORTY STATEMENT VALUES

The median and modal values of the forty statement values are contained in Table 6.2 below.

TABLE 6.2
MEDIAN AND MODAL VALUES OF THE FORTY STATEMENT VALUES

STATEMENT	MEDIAN	MODE
1. Product innovations tend to precede process innovations in my industry.	2	2
2. If market shares are relatively stable and little real product innovation is taking place, the industry is ripe for attack by an invading firm with a radical new product.	2	2
3. Firms need to be able to handle major changes in technology as they occur in order to sustain their competitive position over time.	2	2
4. Firms need to be able to handle major changes in marketplace as they occur in order to sustain their competitive position over time.	1	1
5. Firms that pioneer new products have an advantage over later entrants and will end up with a higher market share in the long run.	2	1
6. Later entrants can do better than pioneers in the long run if there are uncertainties about which technology will eventually dominate the industry.	3	3
7. Later entrants can do better than pioneers in the long run if they have advantages of either lower costs, superior manufacturing techniques, or improved product design.	2	2
8. A frequent cause of new product failure in the marketplace is a lack of customer orientation in the design process.	3	3
9. A product that has a manufacturing or technological advantage but does not fulfill a need in the marketplace is likely to fail.	2	2

10. In product categories marked by rapid change, likely future users are the best source of new product ideas.	3	2
11. Together, product users and the marketplace form the most important source for new product ideas.	2	2
12. Radically new technologies constitute an important source of new product ideas.	2	2
13. Any changes in technology constitute an important source of new product ideas.	2	2
14. Recognition of technological opportunities is essential to product success.	2	2
15. Successful products result from the integration of the needs of the market with the technological opportunities available to fulfil those needs.	2	1
16. Pretest marketing (e.g. simulated test market) is helpful in reducing the cost of developing and introducing new products.	2	2
17. Product development is less costly in the long run if the firm weeds out questionable products by pretest marketing before full-scale test marketing.	2	2
18. Financial risk assessment should be incorporated into new product project evaluation to fully assess the desirability of a new product.	1	1
19. Pretest market and test market procedures reduce uncertainties in market share estimates for new products.	2	2
20. A new product is first adopted by a few innovators who in turn influence others to imitate their behaviour.	2	2
21. The new product adoption process can be described as slow initial growth, followed by rapid growth, and finally slower growth as market sales approach potential.	2	2
22. The market potential of a new product remains constant over time.	4	4
23. Diffusion, or acceptance, of a given product is independent of all other innovations.	4	4
24. Advertising for new products is most beneficial in the adoption process at early stages of introduction.	2	2
25. Advertising levels should be cut back as sales increase and the product progresses through the life-cycle.	3	4
26. Marketing and technical personnel do not communicate effectively with each other.	3	3
27. Marketing and technical personnel generally do not trust each other.	3	3
28. Harmonious interaction between marketing and R&D is associated with improved new product success rates.	2	2
29. Early involvement of both the marketing and R&D departments in the product development process fosters better interaction between the marketing and R&D departments.	1	1

30. Support of top management fosters better interaction between the marketing and R&D departments.	1	1
31. A protocol or formal agreement between marketing and R&D on product performance specifications minimises conflicts and misunderstandings between marketing and technical personnel.	2	2
32. Innovative ideas have a greater chance of eventual new product success when there are fewer participants in the decision system.	3	3
33. Innovative ideas have a greater chance of eventual new product success when there are fewer opposing factions within the firm.	2	2
34. Innovative ideas have a greater chance of eventual new product success when decision-making is centralised.	4	4
35. A key factor that facilitates innovation is the ability to monitor environmental trends.	2	2
36. A key factor that facilitates innovation is organisational flexibility.	2	2
37. A key factor that facilitates innovation is the concentration of power in an organisation.	4	4
38. Once a choice has been made regarding a strategy for resource allocation, firms do best if they concentrate on making those strategies work rather than trying to change the strategy.	2	2
39. It is important for a new product to have a product champion who can offer protection from financial and managerial restraints within the firm.	2	2
40. The success of a new product depends on having the support of the elite power holders within the organisation.	2	2

It is evident that the median and mode for thirty six of the forty statements correspond. For the following statements these two values do not correspond.

- Statement 5 (Firms that pioneer new products have an advantage over later entrants and will end up with a higher market share in the long run)
- Statement 10 (In product categories marked by rigid change, likely future users are the best source of new product ideas)
- Statement 15 (Successful products result from the integration of the needs of the market with the technological opportunities available to fulfil those needs)

- Statement 25 (Advertising levels should be cut back as sales increase and the product progresses through the life-cycle).

Although the mode and median differ for these four statements, no statistically significant difference could be found.

6.5 RELATIONSHIPS BETWEEN ORGANISATIONAL CHARACTERISTICS AND NEW PRODUCT DEVELOPMENT ACTIVITIES.

A number of analyses were undertaken to determine whether there were relationships between certain organisational characteristics and new product development activities.

The specific organisational characteristics studied were:

- Annual turnover
- Number of different products manufactured and marketed
- Number of people employed
- Number of new products launched during the past five years

A summary of these categories is given in Table 6.4. The median was calculated for the above mentioned categories and is as follows:

Annual turnover: R130 million

Number of different products manufactured and marketed: 40

Number of people employed: 150

Number of new products launched during the past five years: 7

These four different categories were each divided into two groups i.e. a group with value smaller and equal to the median, and a group with a value greater than the median. The characteristics of these groups are set out in Table 6.3.

TABLE 6.3
DIVISION OF ORGANISATIONAL CHARACTERISTICS DATA ACCORDING TO THE MEDIAN

	GROUP 1	GROUP 2
TURNOVER	Smaller or equal to R130 million	Greater than R130 million
NUMBER OF PRODUCTS MANUFACTURED	Less than or equal to 40 products	More than 40 products
NUMBER OF EMPLOYEES	Less than or equal to 150 employees	More than 150 employees
NUMBER OF NEW PRODUCTS LAUNCHED IN THE PAST FIVE YEARS	Less than or equal to 7 new products	More than 7 new products

In Table 6.4 the correlation between the different groups is provided. The correlation calculation was done with the use of computer programme STATISTIX 4.1. The two groups were also compared to the Calantone, Di Benedetto and Haggblom's study (see Table 6.5)

When comparing the latter and the current study there was a statistically significant correlation (r^2=0.68) between perception of the respondents of the two studies. Calantone, Di Benedetto and Haggblom's study also correlates statistically significant with the grouping variables. There is no difference between the two groups based on turnover, number of products manufactured, number of employees or number of new products launched in the past five years. There is a statistically significant correlation between the Calantone, Di Benedetto and Haggblom's study and the group representing the larger companies (group 2).

TABLE 6.4
CORRELATION BETWEEN THE DIFFERENT GROUPS

	Turnover group 2	**Manufactured group 2**	**Employee group 2**	**New products group 2**
Turnover group1:r	0,8569			
r2	0,734278			
p-value	0,0000			
Manufactured group 1:r		0,8931		
r2		0,79762761		
p-value		0,000		
Employee Group 1			0,8825	
r2			0,7788063	
p-value			0,0000	
New products Group 1:r				0,889
r2				0,790321
p-value				0,0000

TABLE 6.5
CORRELATION BETWEEN THE TWO DIFFERENT STUDIES

		Turnover		**Products manufactured**		**Employee**		**New Products**	
	Current study	Turnover group 1	Turnover group 2	Manufactured Group 1	Manufactured group 2	Employee group 1	Employee group 2	new products group 1	new products group 2
*CDH STUDY: r	0,8268	0,7508	0,8367	0,7766	0,839	0,7421	0,8566	0,7551	0,85565
r2	0,68359	0,563701	0,700067	0,603108	0,703921	0,5507124	0,7337636	0,570176	0,732137
p-value	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

* CDH study refers to the Calantone, Di Benedetto and Haggblom study of 1995

Table 6.6 is summary of the percentage agreement on the statements, for the different groups mentioned above.

TABLE 6.6
PERCENTAGE AGREEMENT ON THE STATEMENTS BY THE DIFFERENT GROUPS DIVIDED ON THE BASIS OF MEDIAN VALUES OF ORGANISATIONAL CHARACTERISTICS

Statement	Turnover group1	Turnover group 2	Manufactured group 1	Manufactured group 2	Employee group 1	Employee group 2	New products group 1	New products group 2
	(<=median)	(>median)	(<=median)	(>median)	(<=median)	(>median)	(<=median)	(>median)
	<=130	>130	<=40	>40	<=150	>150	<=7	>7
1	40	64,3	43,8	61,5	46,6	57,2	53,3	50
2	86,7	92,9	100	77	86,7	92,9	86,7	92,9
3	100	92,9	100	92,3	100	92,9	100	92,9
4	100	92,9	100	92,3	100	92,9	100	92,9
5	96,7	78,6	81,3	84,7	80	85,7	80	85,7
6	20	28,6	25	23,1	13,3	35,7	13.3	35,7
7	67	57,1	62,5	61,5	66,7	57,1	60	64,2
8	26,7	35,7	37,5	23,1	26,7	35,7	26,7	35,7
9	66,7	85,7	68,8	84,6	73,4	78,6	73,4	78,6
10	73,3	21,4	56,3	38,5	53,3	42,9	46,7	50
11	60	42,9	50,1	53,9	46,7	57,1	46,7	57,1
12	80	71,4	68,8	84,6	80	71,4	80	71,4
13	46,7	71,4	56,3	61,6	53,3	64,3	53,3	64,3
14	86,7	92,9	93,7	84,6	93,3	85,7	93,3	85,7
15	73,4	92,8	81,3	84,7	63,3	92,9	73,3	92,9
16	66,7	71,4	75	61,6	60	78,5	66,6	71,4
17	66,6	71,4	81,3	53,9	66,7	71,5	73,3	64,3
18	93,3	92,9	93,7	92,3	93,3	92,9	93,3	92,9
19	100	64,3	93,7	69,2	93,3	71,4	86,7	78,5
20	96,7	92,8	93,7	84,6	96,7	92,9	86,7	92,9
21	66,7	62,2	75,1	53,9	73,3	57,2	73,3	57,2
22	0	0	0	0	0	0	0	0
23	6,7	7,1	12,6	0	6,7	7,1	6,7	7,1
24	73,3	71,4	87,6	53,9	86,7	57,2	93,3	50
25	33,3	28,5	37,5	23,1	33,3	28,5	33,3	28,5
26	20	28,6	18,8	30,8	20	28,6	20	28,6
27	13,4	7,1	12,6	7,7	6,7	14,3	6,7	14,3
28	100	92,9	100	92,4	100	92,9	100	92,9
29	100	100	100	100	100	100	100	100
30	100	92,9	100	92,3	100	92,9	100	92,9
31	86,7	71,5	81,3	76,9	86,6	71,4	86,7	71,5
32	33,4	35,7	31,3	38,5	26,7	42,8	26,7	42,8
33	66,6	57,1	62,6	61,6	66,6	57,1	66,6	57,1
34	33,3	14,2	25	23,1	33,3	14,2	40	7,1
35	86,7	64,2	81,3	69,2	73,3	78,6	66,7	85,7
36	100	92,9	100	92,3	100	92,9	100	92,9
37	26,7	7,1	31,3	0	33,3	0	33,3	0
38	53,3	78,6	56,3	76,9	53,3	78,6	60	71,4
39	66,7	92,9	68,8	92,3	66,7	92,8	73,4	85,7
40	60	50	56,3	53,9	60	50	53,3	57,2

When taking 50% as representing high agreement and below 50% as low in agreement, it would be seen from Table 6.6 that there was agreement on most of the statements between the two groups of organisations. There were, however, some exceptions.

For statement ten, (In product categories marked by rapid change, likely future users are the best source of new product ideas) turnover group one shows a high agreement (73.3%) and turnover group two shows a low agreement (21.4%). It may thus be deduced that smaller organisations (in terms of turnover) see future users as the best source of new product ideas with regards to the product categories which are marked by rapid change. Larger organisations seem to rely to a larger extent on their internal abilities in respect of product innovation and discovery.

Concerning statement nineteen (Pretest market and test market procedures reduce uncertainties in market share estimates for new products) turnover group one shows a high agreement (100%) in contrast with turnover group two (64.3%). The reason for this difference may be that smaller organisations (in terms of turnover) lack the experience of performing pretest market and test market procedures because of high costs involved and fewer new products launched.

New products group 1 strongly agrees (93.3%) in terms of statement twenty four (Advertising levels should be cut back as sales increase and the product progresses through the life-cycle) in contrast with the new product group two (50%). The reason for this could be that the organisations in new product group two are less familiar with the success and failures of the launching of new products. Larger organisations depend on a number of marketing elements, including advertising.

For statement thirty seven both the groups disagreed regarding the statement that the concentrations of power in an organisation is a key factor that facilitates innovation. New products group 2 showed a percentage of 33%, whereas new products group 1 showed a percentage of 0%. The latter could perhaps be ascribed to the small size of the respondents' firms where internal power play was perhaps not a crucial issue.

6.6 SUMMARY

In this chapter the results of the marketing managers' perceptions with regard to the forty statements on new product development were listed. The respondents of both studies strongly agreed (with percentages above 80%) to statements 3, 4, 15, 18, 28, 30 and 36. These were all

from different categories. The statements for which the respondents of both studies showed a low agreement (both lower than 30%) were 22, 23, 34, 37.

It was found that the respondents in both studies agreed on thirty seven of the forty statements. For statements 10 and 32 Calantone, Di Benedetto and Haggblom's respondents showed a high agreement with these statements, whereas a low agreement was recorded for the current study's respondents. As for statement 12 the results indicated that the respondents of the current study strongly agreed with the statement, whilst the other study's respondents showed a low agreement.

When comparing the study of Calantone, Di Benedetto and Haggblom and the current study there was a statistically significant correlation (r^2=0.68) between perceptions of the respondents of the two studies. Roger, Calantone, Di Benedetto & Haggblom's study also statistically correlates to a significant degree with the grouping variables. There is no difference between the two groups based on turnover, number of products manufactured, number of employees or number of new products launched in the past five years. There is a statistically significant correlation between the Calantone, Di Benedetto and Haggblom's study and the group representing the larger companies (group 2).

It is evident that marketing practitioners in the South African pharmaceutical industry strongly agree with the fundamental principles of new product development which were identified in academic literature. There is also a significant correlation between this study and the study undertaken by Calantone, Di Benedetto and Haggblom with respect to the percentage agreement on the various statements.

CHAPTER 7

THE FINDINGS OF THE STUDY AND THEIR IMPLICATIONS FOR MARKETING MANAGEMENT EDUCATION

7.1 INTRODUCTION

This chapter will aim to evaluate the degree of agreement between marketing practitioners and the existing academic literature on the fundamental principles of new product development. A further aim will be to compare to what extent marketing practitioners in the South African pharmaceutical industry agree or disagree with the marketing practitioners evaluated in the Calantone, Di Benedetto and Haggblom study of 1995.

Although the latter study covered a wide range of industries, the current study evaluated the perception of marketing practitioners in the South African pharmaceutical industry only. It is nevertheless important to determine to what extent the fundamental principles of new product development are applied in the pharmaceutical industry, because the pharmaceutical industry spends five times more on research and development than any other industry.

7.2 THE CALANTONE, DI BENEDETTO AND HAGGBLOM STUDY AND THE CURRENT STUDY

A comparison of Calantone, Di Benedetto and Haggblom study and the current one indicates that the average agreement of the Calantone, Di Benedetto and Haggblom study was 66.92% and that of the current study 61.95 %. It may consequently be concluded that the marketing practitioners in the pharmaceutical industry in South Africa agree to the same extent than marketing practitioners in the Calantone, Di Benedetto and Haggblom study, and that the principles of new product development are as applicable to the pharmaceutical industry as they are to other industries which were included in the Calantone et al. study.

7.3 THE RELEVANCE OF THE FINDINGS FOR MARKETING MANAGEMENT EDUCATION

Although a comparatively large number of academic researchers have published numerous articles on new product development, the question is often raised whether these findings are relevant and helpful to marketing practitioners. Calantone, Di Benedetto and Haggblom (1995) developed a questionnaire on new product development principles. This questionnaire served as an instrument to garner the views of marketing and technical product development practitioners regarding the new product development principles. The results of this study showed a very high level of agreement by marketing practitioners with practically all principles on which academic researchers lecture, research and publish their findings.

A comparison of the average percentage agreement as a whole on the forty statements between the Calantone, Di Benedetto and Haggblom study and the current study, clearly indicate that the degree of agreement is largely on the same level. The Calantone, Di Benedetto and Haggblom study had an average agreement percentage of 66.92% and the corresponding value for the current study was 61.95%.

Table 7.1 contains a summary of the percentage agreement of the two studies. It is evident that both these studies either strongly agree or strongly disagree on each category. It is also interesting to note that the Calantone, Di Benedetto and Haggblom study showed a higher agreement in each category than the current study, except for the category on product diffusion principles.

TABLE 7.1
PERCENTAGE AGREEMENT PER CATEGORY OF PRINCIPLES PER STUDY

	CDH STUDY	**CURRENT STUDY**
Product innovation principles	75%	71,9%
New product development and Launch principles	80%	69,5%
Product diffusion principles	36,2%	44,25%
Marketing R&D interface principles	83%	67,8%
Organisational principles	60,4%	56,3%
Average percentage agreement	66,92%	61,95%

In conclusion it could be stated that this study confirmed that the new product development principles taught and researched by marketing academics are relevant and useful for marketing practitioners in the pharmaceutical industry.

7.4 RELATIONSHIPS BETWEEN SELECTED ORGANISATIONAL CHARACTERISTICS AND NEW PRODUCT DEVELOPMENT ACTIVITIES

When the correlations were calculated, it was interesting to find that there were no differences between the smaller and larger organisations evaluated in this study and there was a significant correlation (r^2=0.68) between the Calantone, Di Benedetto and Haggblom study and the current study as a whole, including the group representing the larger organisations (group 2). The smaller organisations, however, did not record a significant correlation with the Calantone, Di Benedetto and Haggblom study. This may be because these organisations are on average much smaller than the organisations evaluated by Calantone, Di Benedetto and Haggblom and may, therefore, not be in a position to spend as much on new product developments as would be the case of the larger organisations.

7.5 LIMITATIONS OF THE STUDY

The limitations of this study may be listed as follows:

- Because only the South African Pharmaceutical Industry was scrutinised, the findings cannot claim to be representative of all industries in South Africa.

- The number of organisations which took part in the current study were fewer, although there was a higher response rate (46.3%) than for the Calantone, Di Benedetto and Haggblom study (36.7%). This is not regarded as a serious limitation, as the respondents represent 69.3% of the turnover of the pharmaceutical industry.

- Because some of the local organisations do little, if any, research and development this could have caused some distortion in the evaluation.

7.6 POSSIBLE OBJECTIVES FOR FUTURE RESEARCH

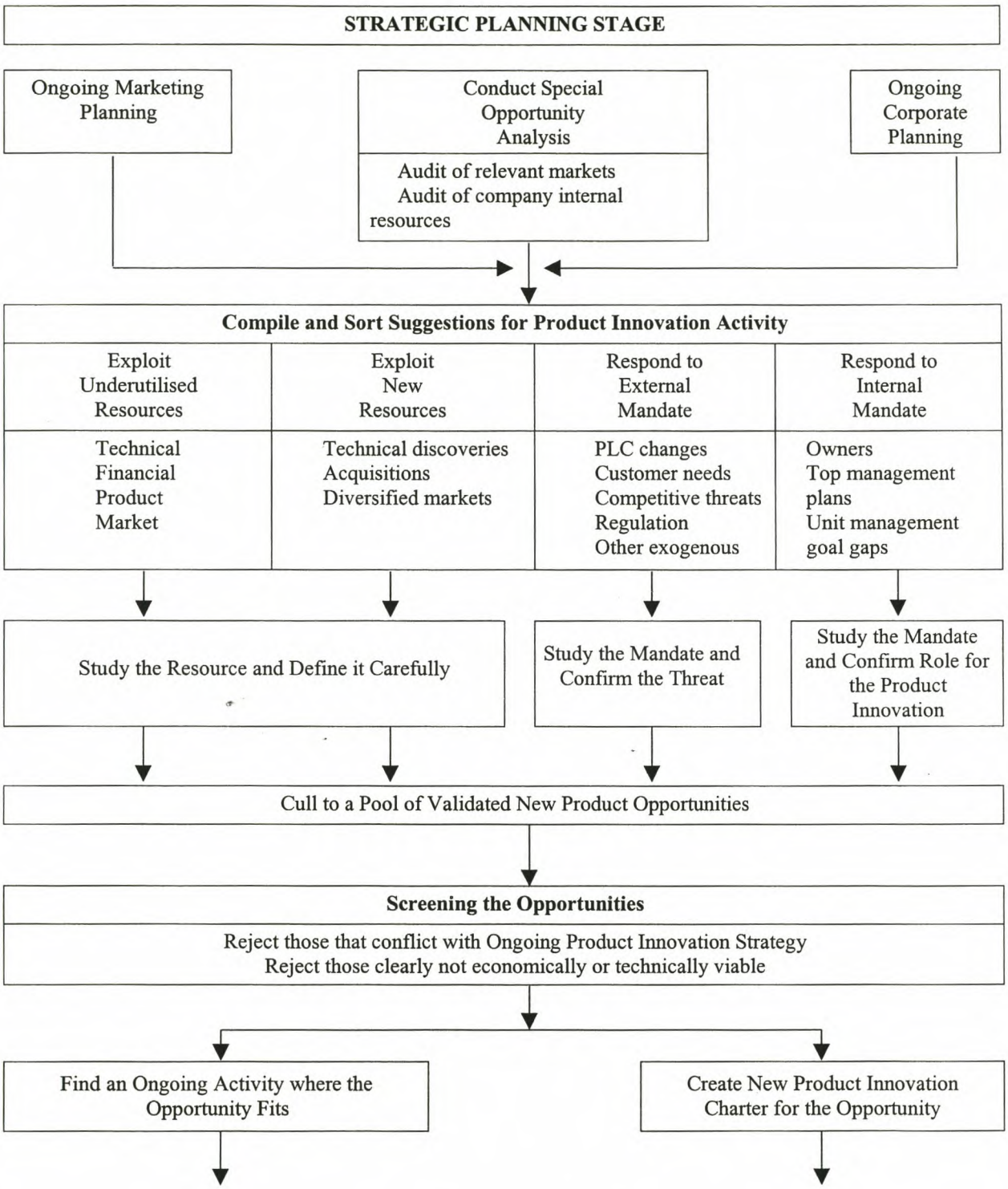
In order to extrapolate the results of this study the following issues could prove to be interesting for further research:

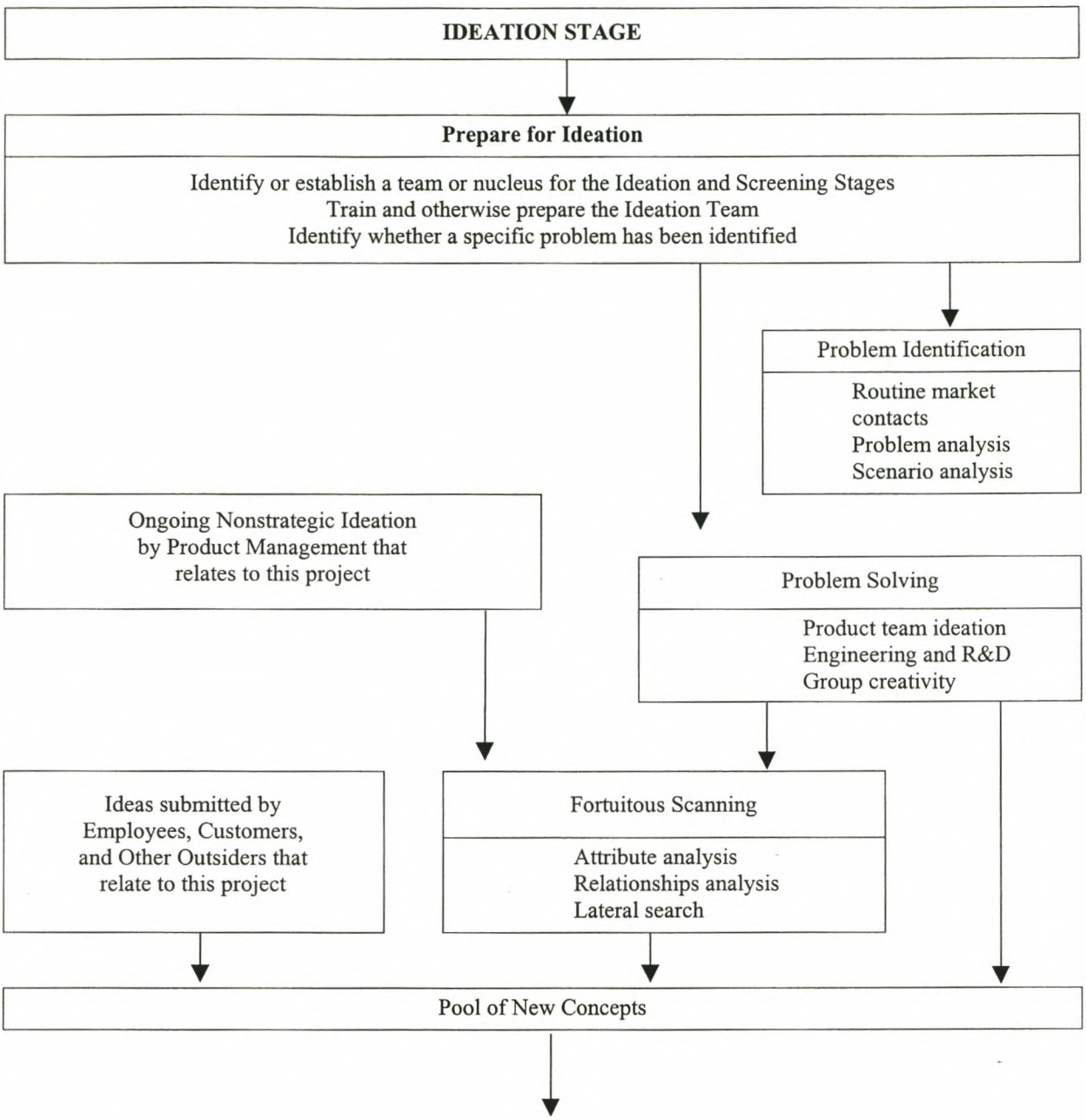
- To scrutinise the perceptions of technical practitioners in the South African pharmaceutical industry on the fundamental principles of new product development.
- To evaluate organisations in other industries regarding the fundamental principles of new product development.
- To investigate the effects of new product introduction on financial parameters, such as sales, profits and earnings.
- To evaluate the new product development process in different organisations.
- To evaluate the role of customers in the decision making processes of new product development.
- To evaluate the extent that sales forces influence the introduction of new products into the market.
- To evaluate the participation of South African pharmaceutical organisations in global new product development.
- To evaluate to what extent organisations use cross-functional teams in South Africa.

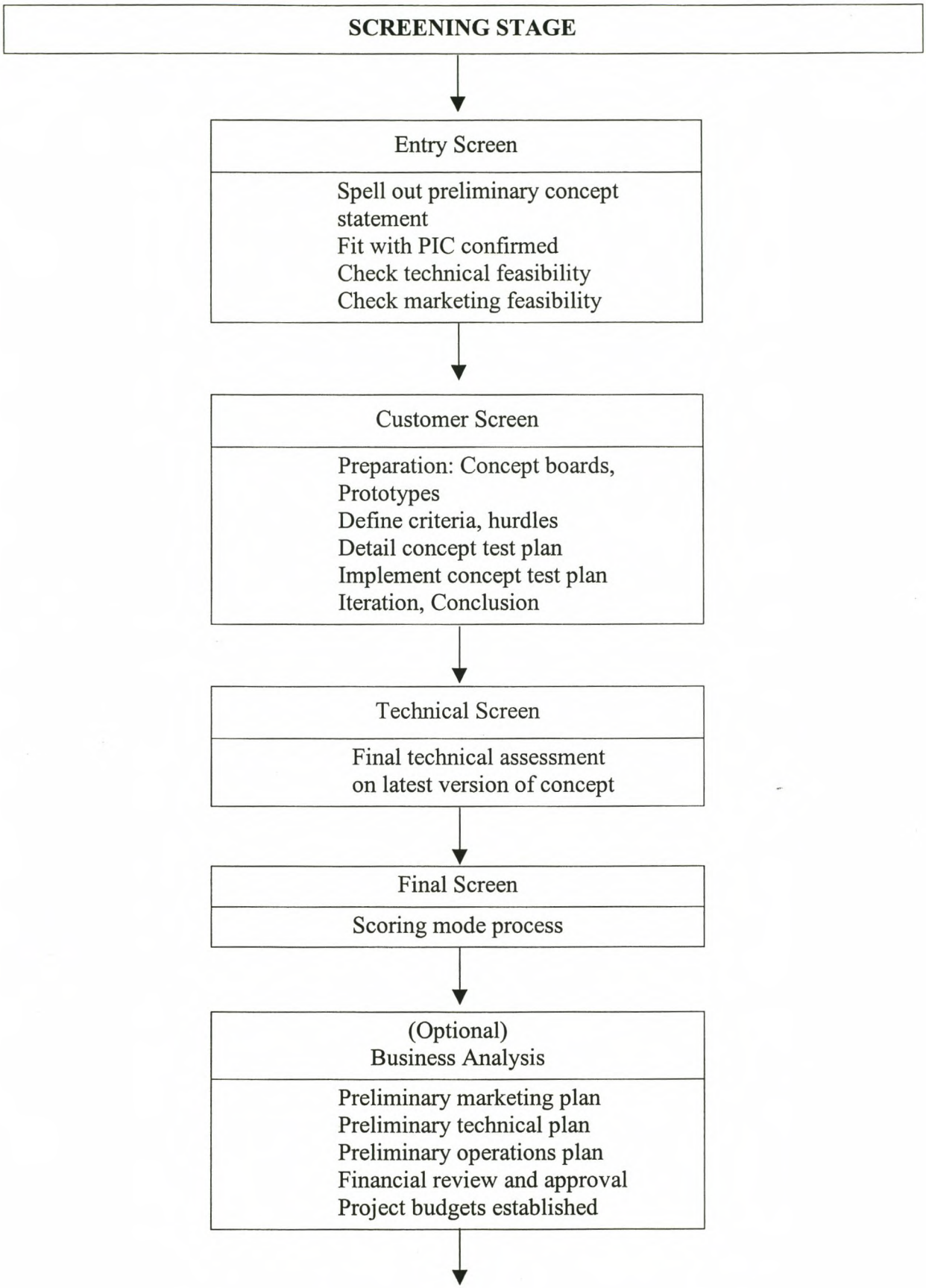
7.7 CONCLUSIONS

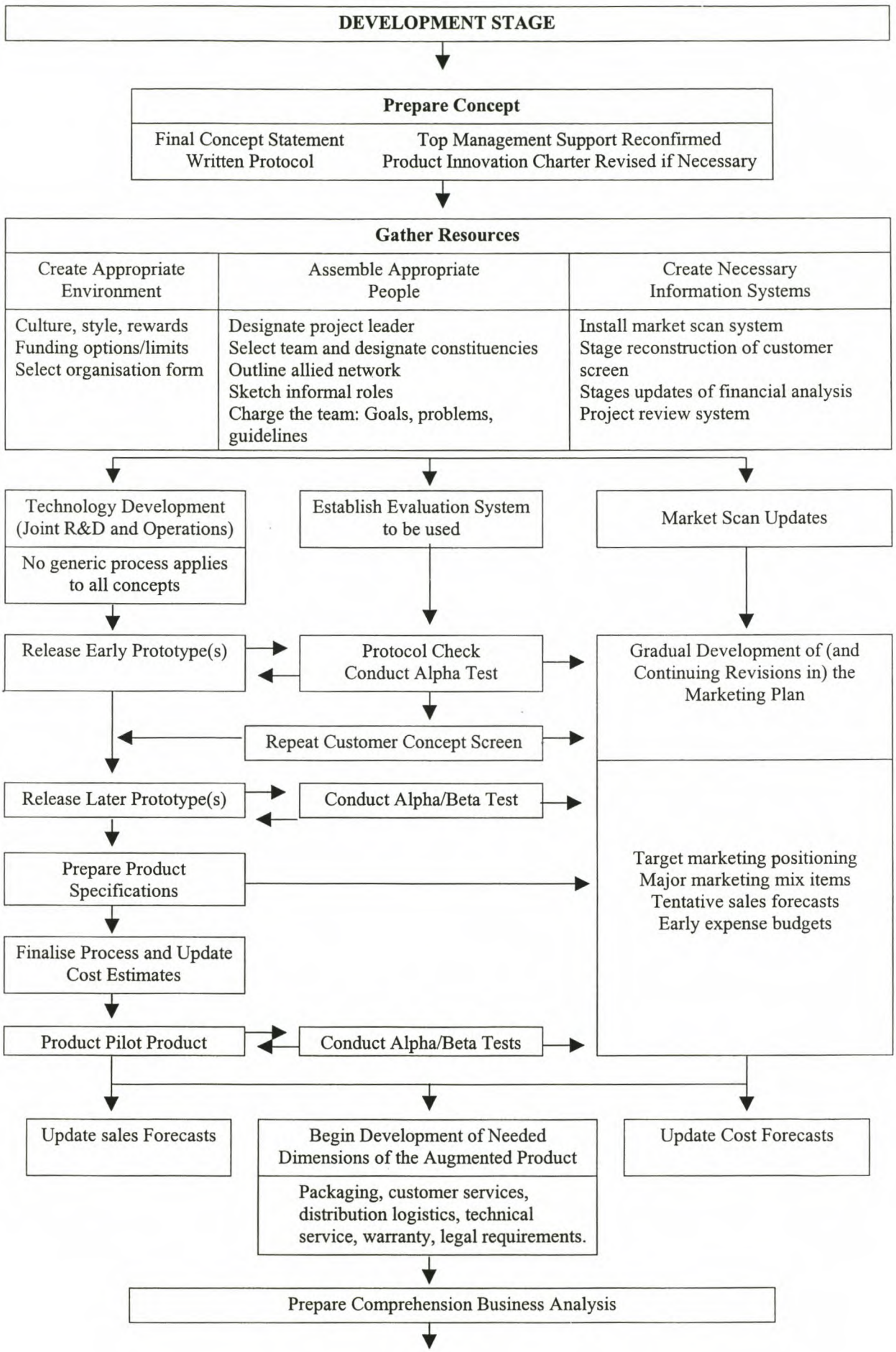
The results of this study indicated that marketing practitioners in the South African pharmaceutical industry strongly agreed with those fundamental principles of new product development which were identified in academic literature. There was also a significant correlation between this study and the study undertaken by Calantone, Di Benedetto and Haggblom with respect to the percentage agreement on the various statements. It may thus be concluded that new product development principles taught in marketing managing courses are relevant for and are applied by marketing practitioners in the pharmaceutical industry in South Africa.

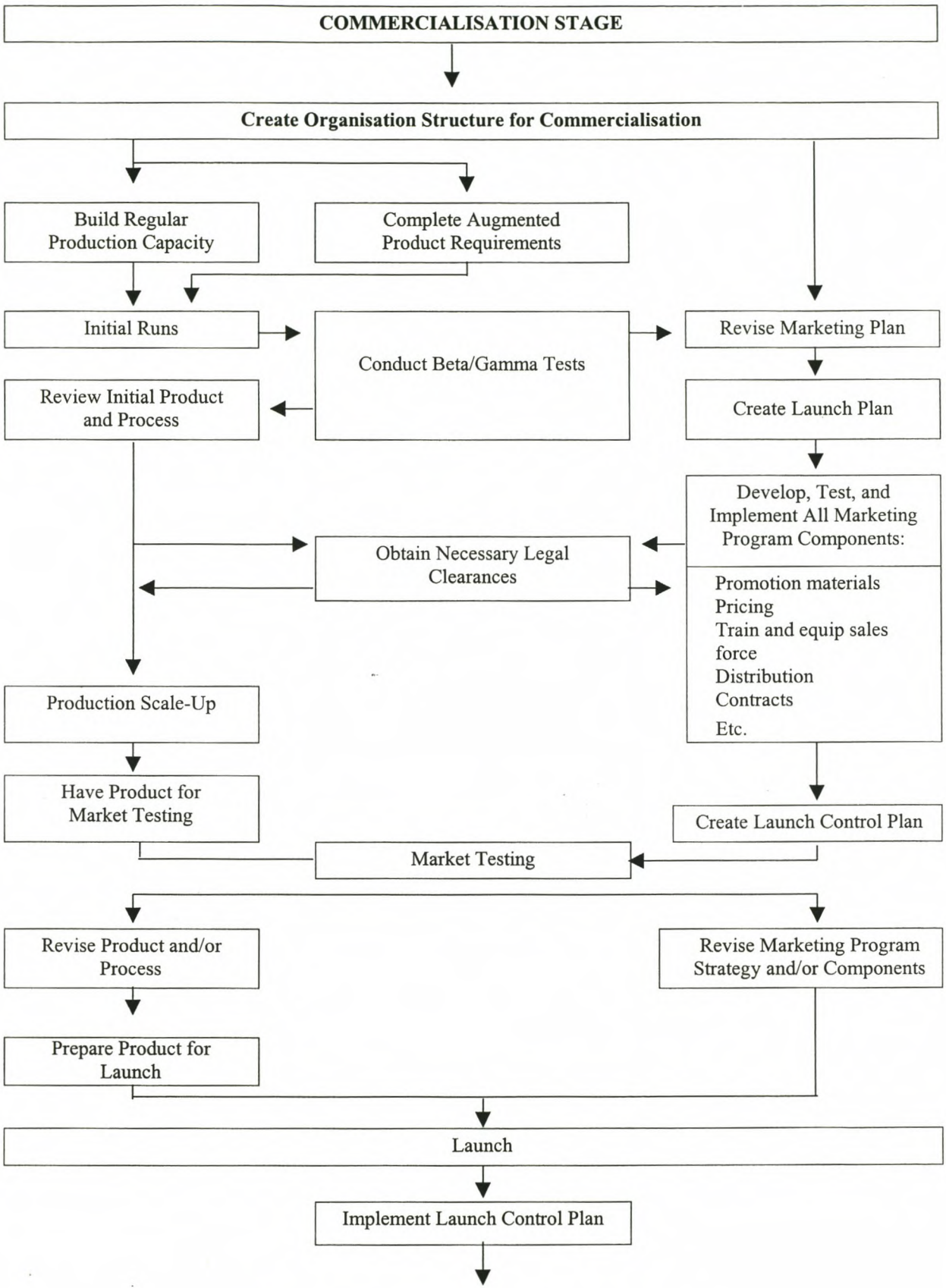
APPENDIX 1
THE PRODUCT INNOVATION PROCESS




IDEATION STAGE
Prepare for Ideation
Identify or establish a team or nucleus for the Ideation and Screening Stages
Train and otherwise prepare the Ideation Team
Identify whether a specific problem has been identified
Problem Identification
Routine market contacts
Problem analysis
Scenario analysis
Ongoing Nonstrategic Ideation by Product Management that relates to this project
Problem Solving
Product team ideation
Engineering and R&D
Group creativity
Ideas submitted by Employees, Customers, and Other Outsiders that relate to this project
Fortuitous Scanning
Attribute analysis
Relationships analysis
Lateral search
Pool of New Concepts


SCREENING STAGE
Entry Screen
Spell out preliminary concept statement
Fit with PIC confirmed
Check technical feasibility
Check marketing feasibility
Customer Screen
Preparation: Concept boards, Prototypes
Define criteria, hurdles
Detail concept test plan
Implement concept test plan
Iteration, Conclusion
Technical Screen
Final technical assessment on latest version of concept
Final Screen
Scoring mode process
(Optional) Business Analysis
Preliminary marketing plan
Preliminary technical plan
Preliminary operations plan
Financial review and approval
Project budgets established


DEVELOPMENT STAGE
Prepare Concept
Final Concept Statement
Written Protocol
Top Management Support Reconfirmed
Product Innovation Charter Revised if Necessary
Gather Resources
Create Appropriate Environment
Assemble Appropriate People
Create Necessary Information Systems
Culture, style, rewards
Funding options/limits
Select organisation form
Designate project leader
Select team and designate constituencies
Outline allied network
Sketch informal roles
Charge the team: Goals, problems, guidelines
Install market scan system
Stage reconstruction of customer screen
Stages updates of financial analysis
Project review system
Technology Development (Joint R&D and Operations)
No generic process applies to all concepts
Establish Evaluation System to be used
Market Scan Updates
Release Early Prototype(s)
Protocol Check
Conduct Alpha Test
Gradual Development of (and Continuing Revisions in) the Marketing Plan
Repeat Customer Concept Screen
Release Later Prototype(s)
Conduct Alpha/Beta Test
Prepare Product Specifications
Target marketing positioning
Major marketing mix items
Tentative sales forecasts
Early expense budgets
Finalise Process and Update Cost Estimates
Product Pilot Product
Conduct Alpha/Beta Tests
Update sales Forecasts
Begin Development of Needed Dimensions of the Augmented Product
Packaging, customer services, distribution logistics, technical service, warranty, legal requirements.
Update Cost Forecasts
Prepare Comprehension Business Analysis


COMMERCIALISATION STAGE
Create Organisation Structure for Commercialisation
Build Regular Production Capacity
Complete Augmented Product Requirements
Initial Runs
Conduct Beta/Gamma Tests
Revise Marketing Plan
Review Initial Product and Process
Create Launch Plan
Develop, Test, and Implement All Marketing Program Components:
Obtain Necessary Legal Clearances
Promotion materials
Pricing
Train and equip sales force
Distribution
Contracts
Etc.
Production Scale-Up
Have Product for Market Testing
Create Launch Control Plan
Market Testing
Revise Product and/or Process
Revise Marketing Program Strategy and/or Components
Prepare Product for Launch
Launch
Implement Launch Control Plan

APPENDIX 2
QUESTIONNAIRE USED FOR THE GATHERING OF DATA

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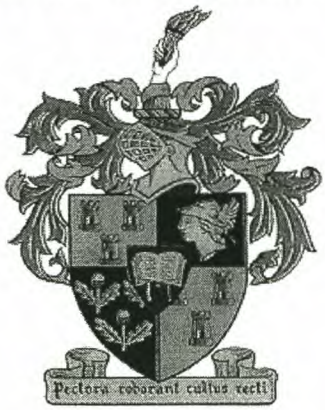

DEPARTMENT OF BUSINESS MANAGEMENT

The statements below are academics' perceptions of principles representative of new product development. Please indicate your view on how true each statement is by placing a cross (x) in the relevant block. A value of 1 means that the statement is almost always true whilst a value of 5 means that the statement is almost always untrue. There are no wrong or correct answers and we are only interested in your opinion.

1.	Product innovations tend to precede process innovations in my industry.	1	2	3	4	5
2.	If market shares are relatively stable and little real product innovation is taking place, the industry is ripe for attack by an invading firm with a radical new product.	1	2	3	4	5
3.	Firms need to be able to handle major changes in technology as they occur in order to sustain their competitive position over time.	1	2	3	4	5
4.	Firms need to be able to handle major changes in the marketplace as they occur in order to sustain their competitive position over time.	1	2	3	4	5
5.	Firms that pioneer new products have an advantage over later entrants and will end up with a higher market share in the long run.	1	2	3	4	5
6.	Later entrants can do better than pioneers in the long run if there are uncertainties about which technology will eventually dominate the industry.	1	2	3	4	5
7.	Later entrants can do better than pioneers in the long run if they have advantages of either lower costs, superior manufacturing techniques, or improved product design.	1	2	3	4	5
8.	A frequent cause of new product failure in the marketplace is a lack of customer orientation in the design process.	1	2	3	4	5
9.	A product that has a manufacturing or technological advantage but does not fulfill a need in the marketplace is likely to fail.	1	2	3	4	5
10.	In product categories marked by rapid change, likely future users are the best source for new product ideas.	1	2	3	4	5
11.	Together, product users and the marketplace form the most important source for new product ideas.	1	2	3	4	5
12.	Radically new technologies constitute an important source of new product ideas.	1	2	3	4	5
13.	Any changes in technology constitute an important source of new product ideas.	1	2	3	4	5
14.	Recognition of technological opportunities is essential to product success.	1	2	3	4	5
15.	Successful products result from the integration of the needs of the market with the technological opportunities available to fulfill those needs.	1	2	3	4	5
16.	Pretest marketing (e.g., simulated test market) is helpful in reducing the cost of developing and introducing new products.	1	2	3	4	5
17.	Product development is less costly in the long run if the firm weeds out questionable products by pretest marketing before full-scale test marketing.	1	2	3	4	5
18.	Financial risk assessment should be incorporated into new product project evaluation to fully assess the desirability of a new product.	1	2	3	4	5

19.	Pre-test market and test market procedures reduce uncertainties in market share estimates for new products.	1	2	3	4	5
20.	A new product is first adopted by a few innovators who in turn influence others to imitate their behavior.	1	2	3	4	5
21.	The new product adoption process can be described as slow initial growth, followed by rapid growth, and finally slower growth as market sales approach potential.	1	2	3	4	5
22.	The market potential of a new product remains constant over time.	1	2	3	4	5
23.	Diffusion, or acceptance, of a given product is independent of all other innovations.	1	2	3	4	5
24.	Advertising for new products is most beneficial in the adoption process at early stages of introduction.	1	2	3	4	5
25.	Advertising levels should be cut back as sales increase and the product progresses through the life cycle.	1	2	3	4	5
26.	Marketing and technical personnel do not communicate effectively with each other.	1	2	3	4	5
27.	Marketing and technical personnel generally do not trust each other.	1	2	3	4	5
28.	Harmonious interaction between marketing and research and development departments is associated with improved new product success rates.	1	2	3	4	5
29.	Early involvement of both the marketing and research and development departments in the product development process fosters better interaction between the departments.	1	2	3	4	5
30.	Support of top management fosters better interaction between the marketing and research and development departments.	1	2	3	4	5
31.	A protocol or formal agreement between marketing and research and development on product performance specifications minimizes conflicts and misunderstandings between marketing and technical personnel.	1	2	3	4	5
32.	Innovative ideas have a greater chance of eventual new product success when there are fewer participant s in the decision system.	1	2	3	4	5
33.	Innovative ideas have a greater chance of eventual new product success when there are fewer opposing factions within the firm.	1	2	3	4	5
34.	Innovative ideas have a greater chance of eventual new product success when decision-making is centralized.	1	2	3	4	5
35.	A key factor that facilitates innovation is the ability to monitor environmental trends.	1	2	3	4	5
36.	A key factor that facilitates innovation is organizational flexibility.	1	2	3	4	5
37.	A key factor that facilitates innovation is the concentration of power in an organization.	1	2	3	4	5
38.	Once a choice has been made regarding a strategy for resource allocation, firms do best if they concentrate on making those strategies work rather than trying to change the strategy.	1	2	3	4	5
39.	It is important for a new product to have a product champion who can offer protection from financial and managerial restraints within the firm.	1	2	3	4	5
40.	The success of a new product depends on having the support of the elite power holders within the organization.	1	2	3	4	5

a) What is your organisation's annual turnover? .....

b) How many different products do your organization manufacture and market? .....

c) How many people are employed by our organization? .....

d) How many new products did your organisation launch during the past five years? .....

APPENDIX 3
SUMMARY OF MARKETING PRACTITIONERS' PERCEPTIONS IN RESPECT OF THE FORTY STATEMENTS RELATED TO NEW PRODUCT DEVELOPMENT

CN \ SN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	2	2	2	1	4	2	2	3	2	3	4	2	2	3	1	3	4	2	4	1	2	4	4	2	2	2	4	2	2	2	4	2	1	3	2	2	4	3	2	4
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Key to table: CN: company number, SN: statement number

REFERENCES

Anderson, D. (1998). Patient recruitment and enrolment- professionalising the process. European Pharmaceutical Contractor, 3, 66-76.

Abernathy, W.J., & Utterback, J.M. (1978). Patterns of industrial innovations. Technology Review, 80(3), 2-9.

Ali, A. (1994). Pioneering versus incremental innovation: review and research propositions. Journal of Product Innovation Management, 11(1), 46-6.

Banting, P.M. (1978). Unsuccessful innovation in the industrial market. Journal of Marketing, 42 (1), 99-100.

Barius, B.(1994). Simultaneous marketing: a holistic marketing approach to shorter time to market. Industrial Marketing Management, 23, 145-154.

Barker, T. (1999). Merck accelerates, Glaxo falters. Scrip Magazine, 1, 39-40.

Bart, C. (1991). Controlling new products in large diversified firms: a presidential perspective. Journal of Product Innovation Management, 8(1), 4-17.

Bass, F. (1969). A new product growth model for consumer durables. Management Science , 15(1), 215-227.

Blattberg, R.R., & Golanty, J. (1978). TRACKER: An early test market forecasting and diagnostic model for new product planning. Journal of Marketing Research, 15(5), 192-202.

Beaumont, V.J. (1999). The registation manual: Health Science Academy.

Bower, J.L., & Hout, T.M. (1988). Fast-cycle capability for competitive power. Harvard Business Review, 66(6), 110-118.

Calantone, R.J., & Di Benedetto, C. A. (1988). An integrative model of the new product development process: an empirical validation. Journal of Product Innovation Management, 5(3), 201-215.

Calantone, R.J., & Di Benedetto, C. A. (1990) Successful industrial product innovation: An integrative literature review. Westport, CT: Greenwood Press.

Calantone, R.J., & Di Benedetto, C. A. (1990). New product development research: state of the art and an agenda for study. In: L.E. Apple and T.P. Hustad (Eds.) Product Development: Prospering in a Rapidly Changing World, Proceedings of the 1990 International Seminar. Product Development and Management Association.

Calantone, R.J., Di Benedetto, C.A., & Meloche, M.S. (1988). Strategies of product and process innovation: a loglinear analysis. R&D Management, 18(1), 13-21.

Calantone, R.J., Di Benedetto, C.A., & Haggblom, T. (1995). Principles of new product management: Exploring beliefs of product practitioners. Journal of Product Innovation Management, 12, 235-247.

Calish, I.G., & Gamache, R.D. (1984). Wizards and champions: the kingdom of new venture management. Journal of Product Innovation Management, 1(4), 238-241.

Cardozo, R.N., & Smith, D. K. (Jr.). (1983). Applying financial portfolio theory to product portfolio decisions: an empirical study. Journal of Marketing, 47(2), 110-119.

Carpenter, G.S., & Nakamoto, K. (1989). Consumer preference formation and pioneering advantage. Journal of Marketing Research, 26(3), 285-298.

Chakrabarti, A.K. (1974). The role of champion in product innovation. California Management Review, 17(2), 58-62.

Clark, K.B. (1989) Project scope and project performance: the effects of parts strategy and supplier inovolvement on product development. Management Science, 35, 124-163.

Cohen, M.A., Eliasberg, J. , & Ho, T.H. (1997). An anatomy of a decision-support system for developing and launching line extensions. Journal of Marketing Research, 34, 117-129.

Cooper, A.C., & Schendel, D. (1976). Strategic responses to technological threats. Business Horizons, 19(2), 61-69.

Cooper, R. (1994). Nissan motor company Ltd.: Target costing system. Harvard University. Case study: Harvard Business School.

Cooper R.G., & Slagmulder, R. (1996). Class notes. MBA Program. De Vlerick School of Management, University of Gent, Belgium.

Cooper, R.G. (1980). Product NEWPROD: What makes a new product a winner? Montreal: Centre Quebecois d'Innovation Industrielle.

Cooper, R.G. (1994). Third generation new product processes. Journal of Product Innovation Management, 11(1), 3-14.

Cooper, R.G., & Kleinschmidt, E.J. (1987). New products: what separates winners form losers? Journal of Product Innovation Management, 4(3), 169-184.

Cooper, R.G., & Kleinschmidt, E.J. (1988). Resource allocation in the new product process. Industrial Marketing Management, 7, 249-262.

Cooper, R.G., & Kleinschmidt, E.J. (1990). New products: the key factors in success. Chicago: American Marketing Association.

Cooper, R.G., & Kleinschmidt, E.J. (1993). Major new products: what distinguishes the winners in the chemical industry? Journal of Product Innovation Management, 10(2), 90-111.

Coovadia, H.M. (1999). The expectations of resource-poor countries in clinical research. Good Clinical Practice Journal, 6(6), 16-17.

Cordero, R. (1991). Managing time efficiently to avoid product obsolenscense: a survey of techniques. Journal of Product Innovation Management, 8(4), 283-295.

Craig, I. (1987). Market pull and technology push I: one company's experience. Information Technology and Public Policy, 5(2), 88-89.

Crawford, C.M. (1984). Protocol: new tool for product innovation. Journal of Product Innovation Management , 1(2), 85-91.

Crawford, C.M. (1991).New products management (3rd ed.) Illinois: Richard D. Irwin.

Darbourne, A. (1999). Slow but steady for world pharmaceutical sales. Scrip Magazine, 1, 29-31.

De Bresson, C., & Townsend, J. (1981). Multivariate models for innovation: looking at the Abernathy-Utterback model with other data. Omega, 9(4), 429-436.

Department of Health (1999). Draft: South African Medicines and Medical Devices Regulatory Act. Pretoria: Author.

Drucker, P.F. (1985). Innovations and entrepreneurship: practice and principles. Oxford: Butterworth-Heinemann.

Eugel, S. (1999). Where the money goes. Pharma Business, 1, 3.

Galt, B. (1987). Market pull and technology push II: research and development. Information Technology and Public Policy, 5(2), 90-92.

Globe, S., Levy, G.W., & Schwartz, C.M. (1978). Key factors and events in the innovation process. Research Management, 21, 8-15.

Goldsbrough, P., Lawyer, P., & Sondhi, G. (1999). The pharmaceutical industry into its second century: from serendipity to strategy. USA: The Boston Consulting Group Report.

Gopal, K. (1997). European report: Patients as partners. Pharmaceutical Executive, 10, 32-34.

Grant, R.M. (1995). Contemporary strategy analysis (2nd ed). Cambridge: Blackwell.

Green, P.E., & Wind, Y. (1975). New way to measure consumers' judgement. Harvard Business Review, 53(4), 107-117.

Gupta, A. K., Raj S.P., & Wilemon, D. (1985). R&D and marketing dialogue in high-tech firms. Industrial Marketing Management, 14, 289-300.

Gupta, A. K., Raj S.P, & Wilemon, D. (1986). A model for studying R&D-marketing interface in the product innovation process. Journal of Marketing, 50(2), 7-17.

Haines, D.W., Chandran, R., & Parkhe, A. (1989). Winning by being the first to market....or second? Journal of Consumer Marketing, 6(1), 63-69.

Hamel, G., & Prahalad, C.K. (1994). Competing for the future. Boston: Harvard Business School Press.

Hauser, J., & Clausing, D. (1988). The house of quality. Harvard Business Review, 66(3), 63-73.

Heeler, R.M. (1986). On the awareness effects of mere distribution. Management Science, 5(3), 273.

Heeler, R.M., & Hustad, T.P. (1980). Problems in predicting new product growth for consumer durables. Management Science, 26(10), 1007-1020.

Heene (1997). Class notes. MBA Program. De Vlerick School for Management, University of Gent, Belgium.

Hise, R.T., Futrell, C., & Snyder, D. (1980) University research centers as a new product development resource. Research Management, 23(3), 25-28.

Hisrich, R.D., & Peters, M.P. (1984). Marketing decisions for new and mature products. Columbus: Charles E. Merrill Publishing Company.

Horsky, D., & Simon, L.S. (1983). Advertising and the diffusion of new products Marketing Science, 2(1), 1-17.

Howard, J.A. (1973). Marketing management (3rd ed.). Illinois: Richard D. Irwin.

Hughes, G. (1998). Strategies for contracting out: what can we learn from other industries? European Pharmaceutical Contractor, 3, 44-50.

John, G., & Martin, J. (1984). Effects of organisational structure and marketing planning on credibility and utilisation of plan output. Journal of Marketing Research, 21(2), 170-183.

Johne, F.A. (1984). The organization of high-technology product innovation. European Journal of Marketing, 18(6/7), 55-71.

Johne, F.A., & Snelson, P. (1988). Auditing product innovation activities in manufacturing firms. R&D Management, 18(3), 227-233.

Kalish, S., & Lilien, G.L. (1986). A market entry timing model for new technologies. Management Science, 32(2), 194-205.

Karagozoglu, N., & Brown, W.B. (1993). Time-based management of the new product development process. Journal of Product Innovation Management, 10(3), 204-215.

Kodama, F. (1995). Analyzing Japanese high technologies: the techno-paradigm shift. New York: Printer.

Kotabe, M., Duhan, D.F., Smith, D.K. (Jr), & Wilson, R.D. (1991). The perceived veracity of PIMS strategy principles in Japan: an empirical enquiry. Journal of Marketing, 55(1), 26-41.

Kotler, P., Armstrong, G. , Saunders, J. , & Wong, V. (1996). Principles of marketing (European ed.). Hemel Hempstead: Prentice Hall.

Lamb, C.W. (Jr.), Hair, J.F. (Jr.), & McDaniel, C. (1998). Marketing (4th ed.) Cincinnati: South-Western College Publishing.

Larson, E.W., & Gobeli, D.H. (1988). Organisation for product development projects. Journal of Product Innovation Management, 4(3), 80-90.

Lilien, G.L. (1983). If the president likes a new product a model won't kill it. Interfaces, 13(3), 54-58.

Link, A., & Zmud, R. (1986). Additional evidence on R&D/marketing interface. IEEE Transactions on Engineering Management EM, 33(1), 43-44.

Luchsinger, V., & Bagby, D.R. (1987). Entrepreneurship and intrapreneurship: behaviors, comparisons, and contrast. SAM Advanced Management Journal, 52,10.

Lynch, J.F. (1997). Where R&D meets marketing - gaining a competitive edge. Script Magazine, 8, 27-28.

Mahajan, V., Muller, E., & Bass, F.M. (1990). New product diffusion models in marketing: a review an directions for research. Journal of Marketing, 54(1), 1- 26.

Marx, S., Van Rooyen, D.C., Bosch, J.K., & Reynders, H.J.J. (1998). Business Management (3rd ed.). Pretoria: Van Schaik.

McAdam, C. (1999). Global and local trends in the pharmaceutical sector. Paper presented at the meeting of International Marketimg services.

McKenzie, S. (1996, June 21). Market research: best of both worlds. Marketing Week, 61-67.

Medicines & Related Substances Act, Act 101 (1965). Department of Health. Pretoria: Government Printer.

Mintzberg, H. (1983). Structure in fives: designing effective organisations. Englewood Cliffs, NJ: Prentice-Hall.

Moenart, R.K., & Sunder, W.E. (1990) An analysis of the use or extrafunctional information by R&D and marketing personnell: review and model. Journal of Product Innovation Management, 17, 213-219.

Moenart, R., & Souder, W.E., De Meyer, A., & Deschoolmeester, D. (1994). R&D-marketing integration mechanisms, communication flows and innovation success. Journal of Product Innovation Management, 11(1), 31-45.

Monthly index of medical specialties. (1999). South Africa: Times Media Limited

Moore, W.L., & Tushman, M.L. (1982). Managing innovation over the product life cycle. In: M.L. Tushman & W.L. Moore (Eds.) Readings in the management of innovation. Marshfield, MA: Pitman.

Norton, J.A., & Bass, F.M. (1987). A diffusion theory model of adoption and substitution for successive generations of high-technology products. Management Science, 33(9), 1069-1086.

O'Neill, J. (1998). Strategy development in a rapidly changing environment. Pharmaceutical Visions, 3, 37-40.

Page, A.L. (1993). Assessing new product development practices and performance: establishing crucial norms. Journal of Product Innovation Management, 10(4), 273-290.

Page, A.L., & Rosenbaum, H.F. (1992). Developing an effective concept testing program for consumer durables. Journal of Product Innovation Management, 9(4), 267-277.

Pearson, A.E. (1988). Tough-minded ways to get innovative. Harvard Business Review, 66(3), 99-106.

Peterson, C. (1999). Development Drivers-World Market Profiles. Pharmaceutical Executive, 19(5), 45-66.

Pinchot, G. (1989). Fostering intrapreneurship organisations. The 1989 Annual: Developing Human Resources.

PPD Pharmaco. (1997). ICH harmonised tripartite guideline E6: Good Clinical Practice Step 5, Consolidated Guideline 1.5.96. Declaration of Helsinki. Wilmington: Author

Pricewaterhouse. (1998). Pharma 2005- An industrial revolution in R&D. USA: Author.

Quinn, J.B. (1985). Managing innovation: controlled chaos. Harvard Business Review, 63(3), 78.

Rinholm, B.L., & Boag, D.A. (1988). Controlling innvation: ready, aim, fire. Proceedings of the First International Conference on Technology Management.

Roberts, E.B., & Peters, D.H. (1982). Commercial innovation from university faculty. Research Management, 25(3), 24-30.

Roberts, E.B. (1988) What we've learned- managing invention and innovations. Research-Technology Management 1, 11-29.

Robinson, W.T., & Fornell, C. (1985). Sources of market pioneer advantages in consumer goods industries. Journal of Marketing Research, 22(4), 305-317.

Rochford, L., & Rudelius, W. (1992). How involving more functional areas within a frim affects the new product process. Journal of Product Innovation Management, 9(4), 287-299.

Romanerle, E. (1987). New venture strategies in the minicomputer industry. California Management Review, 30, 160.

Rosenau, M.D.(Jr.) (1989). From experience: schedule emphasis of new product development personnel. Journal of Product Innovation Management, 6(4), 282-288.

Robertson, T. (1967). The process of innovation and the diffusion of innovation. The Journal of Marketing, 31(1), 14-19.

Ruijten, E. (1997). Fast throughput development - Its possibilities and response from the market. European Pharmaceutical Contractor, 3, 58-61

Scherer, F. (1970). Industrial market structure and economic performance (2nd ed.). Chicago: Rand-McNally.

Schnaars, S.P. (1986). When entering growth markets, are pioneers better than poachers? Business Horizons, 29(2), 27-36.

Shocker, A.D., & Hall, W.G. (1986). Pretest-market models: a critical evaluation. Journal of Product Innovation Management, 3(2), 86-107.

Silk, A.J., & Urban, G.L. Pre-test-market evaluation of new packaged goods: a model and measurement methodology. Journal of Marketing Research, 15(5), 171-191.

Slack, N., Chambers, S., Harland, C., Harrison, A., & Johnston, R. (1995) Operations Management. London: Pitman Publishing.

Song, XM., & Parry, M.E. (1997). A cross-national comparative study of new product development processes: Japan and the United States. Journal of Marketing, 61(2), 1-18.

Song, X.M., Parry, M.E., & Norton, J. (1993). Determinants of R&D-marketing integration and new-product success in American and Japanese chemical firms. In: R.N. Cardozo, K.J. Roering & A.D. Shocker (eds.) Teamwork: Keystone for getting high quality products to market quickly, Proceedings of the 1993 PDMA International Conference.

Souder, W.E. (1988). Managing relations between R&D and marketing in new product development. Journal of Product Innovation Management, 5(1), 6-19.

Souder, W.E., & Chakrabarti, A.K. (1978). The R&D/marketing interface: results from an empirical study of innovation projects. IEEE Transactions on Engineering Management, 25(4), 88-93.

Souder, W.E., & Chakrabarti, A.K. (1980). Managing the coordination of marketing and R&D in the innovation process. In: B.V. Dean & J.L. Goldhar (Eds.). Management of research and innovation. TIMS studies in management sciences.

Srinivasan, V., & Mason, C.H. (1986). Nonlinear least squares estimations of new product diffusion models. Marketing Science, 5(2), 169-178.

Stefflre, V. (1985). Organisational obstacles to innovation: a formultion of the problem. Journal of Product Innovation Management, 2(1), 3-11

Sylvania. (1997). http:// www.sylvania.com. Date of search: June 1997

Tackeuchi, H., & Nonaka, I (1986). The new new product development game. Harvard Business Review, 64(1), 137-146.

Thrift, J. (1997). New product launches: too much good advice. Marketing, 3, 18-20.

Urban, G.L., Carter, T., Gaskin, S., & Mucha, Z. (1986). Market share rewards to pioneering brands: an empirical analysis and strategic implications. Management Science, 32(6), 645-659.

Urban, G.L., & von Hippel, E. (1988). Lead user analyses for the development of new industrial products. Management Science, 34, 569-582.

Utterback, J.M (1981). The dynamics of product and process innovation in industry. In: C.T. Hill & J.M. Utterback (Eds.). Technological innovation for a dynamic economy. New York: Pergamon Press.

Utterback, J.M. (1982). The innovative process: evolution versus revolution. In: The Innovative Process: Evolution Versus Revolution, Proceedings of a Symposium for Senior Executives. Cambridge, MA: Massachutes Institute of Technology.

Utterback, J.M, & Abernathy, W.J. (1975). A dynamic model of product and process innovation. Omega, 3(6), 639-656.

Van der Walt, A., Strydom, J.W. , Marx, S. , & Jooste, C.J. (1996). Marketing Management (3rd ed.). Cape Town: Juta.

Von Hippel, E. (1978). Successful industrial products from customer ideas. Journal of Marketing, 42(1), 39-49.

Von Hippel, E. (1995). Lead users: a source of novel product concepts. Management Science, 32(7), 791-805.

Von Hippel, E. (1988). The sources of innovation. New York: Oxford University Press.

Webster, F. (1988). Rediscovering the marketing concept. Marketing Science Institute Working Paper No. 88-100, Cambridge, MA: Marketing Science Institute.

Wind, J., & Mahajan, V. (1997). Issues and Opportunities in new product development: an introduction to the special issue. Journal of Marketing Research, 34, 1-12.

Zaltman, G., Duncan, R., & Holbeck, J. (1973). Innovations and organisations. New York: Wiley.